Recurring issues and concerns in wind energy project Environmental Assessments: analysis of western Canada

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Abstract

Investment in renewable energy is essential to a low carbon future. Wind energy is Canada's fastest growing renewable energy sector. Although not as disputed as fossil fuel-based energy projects, such as oil sands mines or pipelines, wind energy projects can be controversial. Understanding the typical issues and concerns that emerge when wind energy projects are proposed is important to manage the transaction costs for renewable energy projects. This research examined 16 environmental assessments (EAs) for wind energy projects in western Canada to determine the recurring issues and concerns raised by government reviewers, project interveners, and other affected interests when projects are tabled. A total of 50 different issues were identified. These were raised 848 times in EA comments and submissions. Although variability existed in the number and diversity of issues by jurisdiction and by project, depending on location and size, concerns about land use, impacts on human well-being, impacts on natural ecosystems, and economic opportunity and impact, represented 79% of all issues and concerns. The majority of issues reflect project-specific impacts and concerns, but many issues including impacts to other land tenure holders or licensees (such as other utilities and industries) are issues that are beyond the scope and scale of what can be resolved at the time wind energy projects are proposed. Understanding and addressing the recurrent issues and concerns raised when wind energy projects are proposed and identifying and off-ramping the bigger issues to the planning and strategic process, are important conditions for energy transition.

Keywords: Wind energy, environmental assessment, recurring project and strategic issues.

Field: Environmental Geography

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List of Abbreviations

AB- Alberta

AUC- Alberta Utility Commission

BC- British Columbia.

CANWEA- Canadian Wind Energy Association

CCME- Canadian Council Of Ministers of Environment

CO_2- Carbon-dioxide

DDPP- Deep Decarbonization Pathways Project

EA- Environmental Assessment

EAA - Environmental Assessment Act

EAP -Environmental Act Proposal

EIS - Environmental Impact Statement

GHG- Green House Gas

IAA - Impact Assessment Act

IRENA- International Renewable Energy Agency

MB- Manitoba

NWI- Northwest Institute

PCWIS- Pan-Canadian Wind Integration Study

PV- Photovoltaics

SEA- Strategic Environmental Assessment

SK- Saskatchewan

TFEC- Total Final Energy Consumption

TLU- Traditional Land Use

TU- Traditional Use

UK- United Kingdom

WCEL- West Coast Environmental Law

Chapter 1
INTRODUCTION

Canada is the 4th largest producer of renewable energy. The transition from fossil fuels to renewable energy resources is necessary, but it is a complex task that will require significant policy change, changes in consumer behavior, and investment in new energy project infrastructure, among others (Labanca, 2017). Wind energy, one source of renewable energy, is growing rapidly worldwide and is also the fastest growing renewable energy sector in Canada (CANWEA, 2020; Dai et al., 2015). Although sometimes viewed as ‘clean energy’, due to its negligible emissions of greenhouse gases (GHGs) from electrical generation in comparison to fossil fuel sources, wind energy development is not without adverse environmental impacts and social controversy (Devine-Wright, 2005; Hirsh & Sovacool, 2013; Jami & Walsh, 2017; Mclaren Loring, 2007; Phylip-Jones & Fischer, 2013; Songsore & Buzzelli, 2015).

In Ontario, Canada, for example, Deignan et al. (2013) report that the recent growth in the number of wind turbines is causing increasing concerns among individuals and community organizations, especially concerns related to bird collisions and landscape aesthetics, and Walker et al. (2015) report backlash from local communities concerning perceived negative health effects from wind turbines. Devine-Wright (2005) have also identified conflict arising from wind energy developments in the UK, and Eltham et al. (2008) report on public concerns about the perceived environmental and socio-economic impacts of wind energy development. Hirsh & Sovacool (2013) believe that there are valid concerns with wind energy development that engender environmental consequences and opposition. As a result, despite having potential to address climate change, wind energy development often leads to significant and organized resistance due to its real or perceived health and ecological impacts and social conflict (Jami & Walsh, 2017). While understanding of issues raised regarding wind energy is evolving, new issues continue to emerge (Baxter et al., 2013). Therefore, it is important to identify the common issues and concerns associated with development, and to explore opportunities to address new and enduring ones.

Environmental assessment (EA) is the primary instrument for identifying, assessing and finding ways to manage the impacts of development – including renewable energy projects (Hanna et al., 2016; Noble, 2017). In doing so, EA provides an opportunity for the publics, including interest groups, affected communities, and government agencies, to participate in the project review process and identify issues, concerns, and even management solution (Diduck & Sinclair, 2002; O'Faircheallaigh, 2010; Udofia et al., 2015). This opportunity is an essential component of the EA process, and is important to facilitating informed decision making (Peterlin et al, 2006; Sinclair & Diduck, 2005; Tromans & Fuller, 2003). Sinclair & Diduck (2005) describe participation in the EA process as including opportunities to comment on any proposed development action; however, there is often disillusionment and scepticism about the value of EA for addressing many issues that arise when development projects are proposed (Fuggle, 2005; Noble, 2017). Fuggle (2005), for example, suggests that too much might be expected of a project-based, regulatory instrument to address the wide range of issues and concerns often raised by the public and interest groups. Cashmore (2004) also argues that some societal priorities and values recognized in science may be ill-suited to the EA process.

Several issues related to wind energy projects are important for understanding and facilitating renewable energy transition - such as dealing with cumulative impacts, comprehensive land use planning, climate change policy, and Treaty and Aboriginal rights (Doelle & Critchley, 2015; Smart et al., 2014), but they are not necessarily a good fit with the scope of project EA and approval processes (Booth & Skelton, 2011a; Chetkiewicz & Linther, 2014; Haddock, 2010; Noble, 2017 Udofia et al. 2017). Gibson et al. (2010) argue that some of the bigger-picture, strategic-level issues that emerge in project level assessment could hardly be possible to address effectively and efficiently. For example, Booth & Skelton (2011b), agree, noting that EA is not the correct instrument to assess and measure Indigenous social and cultural concerns. Chetkiewicz & Lintner (2014) similarly describe the limited scope and capacity of EA to deal with broader-scale issues, such as cumulative impacts. Larsen et al. (2018) also report that the transition to renewable energy can cause conflicts due to inadequate consideration of some social issues in EA for renewable energy projects. Attempting to address more narrowly scoped project specific issues along with these complex “bigger picture” issues at the time and scale of single project assessments can result in delayed EAs – and thus delayed investment, conflict, and lost economic development opportunities (Chetkiewicz & Linther, 2014; Hegmann & Yarranton, 2011; Larsen et al., 2018 Noble, 2017; Smart et al., 2014).

If EA is to be a meaningful process in managing the impacts of renewable energy projects, while at the same time facilitating transition, there is a need to identify and understand recurring issues and concerns raised by government reviewers, project interveners, and other affected interests during EA application (Booth & Skelton, 2011c; Graham et al., 2009). Understanding the typical issues and concerns that emerge when wind energy projects are proposed is important to manage the transaction costs for renewable energy projects. Transaction costs for renewable energy projects could include "the costs of searching for and assessing technical information, those associated with negotiations, those related to regulatory uncertainty, and those of implementing and monitoring emissions reductions for less-proven technologies" and transaction cost could increase due to delay and uncertainty in the approval process (Mundaca et al., 2013, p. 2). There is also a bigger transaction cost associated with the role of EA in energy transition. If the renewable energy projects approval is delayed, the GHGs emission is not off-setting for continuing reliance on fossil-fuel based energy sources. The problem is that there is limited direction in scholarship and policy as to which typical issues and concerns are raised during EA applications and are appropriately within the scope of project EA processes.

Therefore, the **purpose** of this research is to determine which issues typically emerge during EA applications for wind energy projects and understand whether these issues can be addressed efficiently and effectively through project level EA. Based on an analysis of wind-energy EA applications, including public submissions and interventions, the **objectives** of this research are to:

- examine the breadth of issues and concerns raised by project reviewers, interveners, and other affected interests when wind energy projects are proposed
- determine the typical or recurring issues and themes, and
- identify potential strategic vs project issues for facilitating EA for wind energy development

Chapter 2
LITERATURE REVIEW

The following review introduces energy transition and its necessity, including the growing demand for energy resources and the increasing opportunity for renewable energy development. It then introduces EA as the primary tool for assessing and mitigating the impacts of renewable energy projects including wind energy projects. Following this, it addresses the scope of project-based EA approaches. Last, it shows the importance of identifying and understanding typical issues raised when wind energy projects are proposed in order to improve EA for wind energy development.

2.1 Energy transition

Energy transition is a common term in energy studies and in the national energy policy of some countries (Bridge et al., 2013). Zhang et al. (2018, p. 174) define energy transition as “a transition in the long-term amount of energy supply and demand, fundamental energy structure, energy consumption volume, environmental impacts of energy consumption changes, and associated underlying driving forces”. Transition to an energy system in which the use of fossil fuels is minimal is essential for ensuring clean energy for everyone (Steg et al., 2018), and transitioning from a fossil-fuel-based energy system to one that is efficient and low-carbon is a major challenge of the twenty-first century (Bridge et al., 2013). Ensuring security and reliability of energy supply and universal access to energy service in a carbon-constrained world will require developing new ways for energy production (Bridge et al., 2013), and many countries have already endorsed decarbonization strategies for energy transition (Blazejczak et al., 2014; IPCC, 2011). In the UK, for example, government policy refers to the movement towards a ‘secure, low carbon’ future with a target of 80% reduction in CO_2 by 2050 (Bridge et al., 2013). This global transition in the energy sector (IRENA, 2018) is being driven and shaped by several interrelated factors, from increasing energy demand and climate commitments, to technological innovation in renewable energy.

2.1.1 Increasing energy demand and electrification

First, energy demand is experiencing a soaring increase. The growing world population and increasing demand for energy exert great pressure on nature’s finite resources. According to a recent IEA (2008) report, the global energy demand is growing at a rate of about 1.6% per year and is expected to reach about 700×10^{18} J/Year by 2030, with more than 80% of worldwide primary energy production coming from combustion of fossil fuels (Pekala et al, 2010). As global energy consumption is increasing, and our energy production is highly dominated by fossil fuels (Van Der Zwaan & Gerlagh, 2006), it is a common concern that the fossil fuels alone will not meet demand (Javed et al., 2016).

Electrification will also play a prominent role in global energy transition, including for transport, heat and other energy services. Analysis of the IRENA (2018) report provides evidence that usages of different forms of electrification of end uses including electromobility are on record. Increasing demand for electricity consumption is recorded for the end use of buildings, industry and transport (IRENA, 2018). Hafner and Noussan (2020) argue that deep electrification can also contribute to the reduction in energy-related CO_2 emissions. Electrification reduces GHG emissions by substituting fossil fuels with electricity and ensuring that low-emitting sources are used for electricity generation (Melton & Moawad, 2016).

In Canada, energy demand per capita is at an all-time high. Since Canada's economy is largely dependent on energy, reliable and sustainable energy production and consumption are essential for economic security (Aslani et al, 2019). Canada Energy Regulator (2019) projects moderate growth in end-use energy demand over the next 20 years. Experts think that Canada needs increased electrification of energy usage and transportation to meet its energy security alongside its emission reduction targets (Bataille et al., 2015; Demerse, 20 July, 2016; Hughes, 2018). Potvin et al (2017) argue that a sustainable energy system will require enhanced electrification with very low- or zero carbon energy sources. Moreover, energy demand is increased by enhanced electrification of energy end-use services.

2.1.2 Economic volatility

The price of energy commodities have significant effects on economies all over the world (Gormus, 2013). Large changes in oil price, both increases and decreases, have negative effects on economic activity (Rafiq et al., 2009), giving rise to volatility in energy markets (Lieberman & Doherty, 2010). Volatility in energy markets is a major driver of present energy transition and the shift towards low-carbon energy alternatives (Potvin et al., 2017; Sinha & Kern, 2015).

Bataille et al. (2015) found that variation in natural gas and oil prices will require a change in Canada's energy mix. Their report highlights that oil and gas prices also have significant impact on Canada's GHG emission trajectory through energy production and consumption. At present, global uncertainty due to a recent fall in oil and gas prices is largely influencing the energy market competitiveness of Canada (Porter et al., August 2020). Renewable energy is expected to diversify the energy mix and lessen environmental problems associated with carbon emissions while offering stabilization of energy prices (Apergis & Payne, 2012; Lieberman & Doherty, 2010). Potvin et al. (2017) also articulate the importance of a low carbon future whilst maintaining energy market competitiveness in Canada in their report- *Re-Energizing Canada: Pathways to a Low-Carbon Future*.

2.1.3 Climate change and government response

In the 20^{th} century, the links among fossil fuel burning, climate change and environmental impacts have become increasingly clear (Hoffert et al., 2002). As the risks of climate change become more evident, the necessity of shifting to a low-carbon economy has also been recognized internationally (Chasek et al., 2006; Chung & Kim, 2018; Moan & Smith, 2007; Potvin et al., 2017; Sussman & Daynes, 2013).

Addressing GHG emissions while securing energy supply, the use of renewable energy has been identified as a priority (Beylot et al., 2019; Potvin et al., 2017). Reduction of fossil fuel usage and GHG emission is an important priority of global sustainable development goals in order to limit climate change (Chapman et al., 2018). The Paris Agreement at the 21st Conference of the Parties to the United Framework Convention on Climate Change emphasized the necessity of a carbon-constrained energy sector drawing attention of investors, businesses, and policy-makers to the fact that global transition towards clean energy has been underway (Costa-Campi et al., 2017). Kern & Rogge (2016) also argued that the 2015 Paris agreement demonstrates a global commitment to move towards a low carbon economy which will accelerate significantly current decarbonization trends.

With an objective to explore deep decarbonization pathways consistent with limiting global temperatures to +2° C while maintaining global prosperity, the Deep Decarbonization Pathways

Project (DDPP)[1] sets a target for 16 countries[2] including Canada to limit GHG emissions at 1.7 tons per capita by 2050 (Bataille et al., 2015). One of the most effective pathways to achieve deep decarbonization is fuel switching to low-carbon electricity and Canada has the potential to achieve deep reductions in GHG emission with its abundant untapped renewable resources (Potvin et al., 2017).

Canada's electricity grid is already more than 80 per cent emissions-free, the cleanest in the G7 (CANWEA, 2020). Although changing market and technology dynamics for energy products and services play important role in global energy transition, the main motivation of Canada to emphasize on energy transition is the urgent need of global GHG emissions reduction to address rising risks and impacts of climate change (Generation Energy, 2018). Therefore, Canada is committed to the global action of the Paris Agreement in 2015, pledging to reduce carbon emissions 30 percent below 2005 levels by 2030 (Davis et al., 2018; Government of Canada, 2016), with deeper reductions beyond that (Mascher, 2018). Canada adopted a national climate change plan - the *Pan-Canadian Framework on Clean Growth and Climate Change*, to achieve this climate change mitigation goal reducing carbon pollution and achieve clean growth (Government of Canada, 2016; Mascher, 2018). The federal government has also committed to have 90 percent of Canada's electricity generating from non-emitting sources by 2030 (Government of Canada, 2018).

2.1.4 Innovation in energy technologies

Innovation will also influence the future energy demand and the desired energy forms. Sovacool & Geels (2016) show how innovation and new technology have significant influence on energy transition. Innovation plays a crucial role in low-carbon energy transition by reducing price and improving technological performance of low-carbon technology, creating new market and disrupting existing systems and capturing public enthusiasm around low-carbon technology (Geels et al., 2017). Innovation efforts to develop and deploy energy technologies are necessary for climate protection. For example, Wilson et al. (2012) found that efficient end-use technologies

[1] DDPP (Deep Decarbonization Pathways Project) is an initiative of the United Nations Sustainable Development Solutions Network (UNSDSN) and Institute for Sustainable Development and International Relations (IDDRI)
[2] As of early 2016, DDPP was composed of 16 Countries- Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, South Africa, South Korea, the United Kingdom, and the United States

contribute to potential emission reductions. Canada also emphasizes on low-carbon innovation, for example, recent policies including *Pan-Canadian Framework on clean growth and climate change* are accelerating innovation to develop technologies, services, novel practices, and business models to improve energy and resource efficiency and boost global competitiveness while meeting environmental objectives (Potvin et al., 2017; Rosenbloom et al., 2018). Hanna et al. (2016) indicate that innovation will drive new demands for electricity and create new opportunities for Canada, for example, increased demand for electricity in the United States could provide new regional market for Canadian clean electricity. They suggest that potential contribution from low carbon technology (e.g. wind, solar, hydro and nuclear systems) could be substantial and sustainable for new research and development capacities, and innovative manufacturing opportunities.

2.2 Renewable energy development

Energy transition is mainly being driven by the aim of reducing CO_2 emissions from energy production and consumption, yet there is also a recognized need for a sufficient and sustainable energy supply to support growing populations and economic development (IRENA, 2018). One of the key solutions to climate change mitigation while ensuring sustainable energy supply is energy transition from fossil fuels to renewable energy sources (Balcilar et al., 2018; IPCC, 2007; IRENA, 2018; Liu et al., 2014). Renewable energy transition has a wider range of benefits than simply carbon emissions reduction, such as universal energy access, human health improvement, energy security, and diversified energy supply (IRENA, 2018). According to the predictions of the European Renewable Energy Council, renewable energy will contribute about half of the total global energy supplies in 2040 (Kralova & Sj€oblom, 2010). IRENA (2018) concluded that 90% of the reduction in energy-related CO_2 emissions is possible with the help of renewable energy along with energy efficiency.

The use of renewable energy has increased significantly during the last decade (Gozgor, 2018). In 2019, the world additional installed renewable power capacity achieved a new record of 176 gigawatts (REN21, 2020). Since 2012, renewable energy have accounted for more than 50% of all global power generation capacity additions (Gielen et al., 2019). Despite significant progress of renewable energy in global new power generation capacity, the overall share of renewables in total final energy consumption (TFEC) is having only a moderate increase (REN21, 2020). To achieve global climate objectives, the share of renewable energy in the total final energy consumption must increase from 19% in 2017 to 65% by 2050 (Gielen et al., 2019; Solaun & Cerdá, 2019). Bioenergy, hydropower, solar energy, wind energy, geothermal and ocean power are the major renewable contributors to global final energy demand (Bhattacharya et al., 2016).

IRENA (2018b) demonstrates that it is no more a truth that renewable power generation is expensive given that renewable power generation is now cost-efficient and increasingly providing electricity at lower cost. For example, the levelised cost of electricity from solar photovoltaics (PV) decreased between 2010 and 2017 and onshore wind energy has become a significantly competitive option for improved technology and installed cost reductions. Thus, the renewable energy industry is on a trend of cost reductions achieved by technology improvements, competitive procurement, and a large base of experienced, internationally active project developers (IRENA, 2018b).

Arguably, the most effective way to reduce emissions with economic growth and equity is to develop revolutionary changes in the technology of energy production (Hoffert et al., 2002). In 2017, more than 380,000 Canadians gave their opinion on Canada's energy future in the Generation Energy dialogues and they shared a collective vision of their energy future built on three pillars: affordability, reliability and cleanliness. In the Generation Energy council report of 2018, it is argued that affordability and reliability have already been in the energy sector of Canada and the demand for clean and efficient energy is driving the need for alternative energy development in Canada (Generation Energy, 2018). The Canadian Council on Renewable Electricity (2016) gives a key message that Canada's abundant renewable electricity resources offer the country a competitive advantage in global efforts to cut carbon pollution and deliver clean growth and can power its economy while it is trying to shift from fossil fuels to clean energy.

Canada is endowed with abundant renewable energy sources like vast hydroelectric power, multiple nuclear facilities and fast-growing wind and solar capacity and these sources have an enormous opportunity to expand access to affordable, reliable and clean energy across the country with the plummeting costs of renewable energy development (Generation Energy, 2018). As Canada is moving forward with the development of new clean energy sources, regulators and alternative energy advocates may face many of the inherent challenges in implementing change and plugging new sources and systems into current infrastructure (Smith et al., 2005).

2.3 Environmental Assessment

Like conventional energy sources, renewable energy production also has environmental impacts and can generate socio-cultural concerns (Abbasi & Abbasi, 2000; Klugmann-Radziemska, 2014; Saidur et al., 2011; Tsoutsos et al., 2005). Patel & Shrivastava (2009) demonstrate that although renewable energy is often assumed as harmless, this does not mean it has no environmental consequences. They found that generally renewable energy is more environmentally friendly than other energy sources and ensures low-carbon energy transition, but renewable energy sources can have significant aesthetic impacts and impacts on ecosystem functioning. Huang (2010) says that despite having relatively low levels of GHG emissions and conventional air pollution, renewable energy sources produces some emissions and pollutants during manufacturing and transporting the technology and equipment to harness energy. Concerns associated with renewable energy development often go beyond biophysical impacts, for example, concerns related to impact on livelihoods, impact on social value and tradition, land use conflicts and contribution to GHG reduction often emerge with renewable energy project (Fjellheim & Carl, 01 Aug 2020; Norman, 2020; Smart et al., 2014; Szpak, 2019; Tabassum-Abbasi et al; 2014).

Understanding the potential environmental and social impacts associated with producing power from renewable sources is important to develop sound policies and for identifying and pursuing designs, manufacturing methods, project siting, utility operations, and so on to mitigate or offset these effects (Huang, 2010; Klugmann-Radziemska, 2014). EA is a primary instrument for assessing and managing the potential impacts of any development project. It is employed to identify and evaluate the potential environmental and social impacts of proposed development projects, and to propose strategies for managing those impacts before a development project commences (Cashmore et al. 2004; Leung et al. 2016). Thus it provides decision makers and stakeholders with a complete understanding of a proposed project and facilitates informed decision making (Cashmore et al., 2004). Although the practice and implementation of EA methods may vary across jurisdiction, EA is widely used in Canada, and globally for planning and decision making and managing the impacts of development projects- including renewable energy projects (Cashmore, 2004; Hanna et al. 2019; Morgan, 2012; Noble, 2017). Ultimately, EA is a decision making tool employed to identify, assess and find ways to manage the impacts anticipated from certain proposed development actions aiming to facilitate informed decision-making and sound environmental management (Cashmore et al., 2004). The value of the EA process thus lies in its capacity to provide useful information in an effective, efficient and cost-effective manner (Hickey et al., 2010).

2.3.1 Scope and focus of project-based EA

Although it is generally accepted that EA is a process for assessing the environmental impacts of development actions in advance of project approval, Fuggle (2005) and Noble (2017) argue that there is disillusionment and scepticism about the value of EA for addressing many issues that arise when development projects are proposed. EA is primarily designed to address project-specific issues, as established under current laws and regulations. However, there are many issues of greater concern when projects are proposed which are beyond the scope and scale of individual project reviews (Gibson et al., 2010; Noble, 2017; Udofia et al., 2017). For example, EA does not adequately consider the regional and cumulative effects of development initiatives (Cooper & Sheate, 2004; Duinker & Greig, 2006; Gunn & Noble, 2011; Kennett, 2000; Dubé, 2003; Lee and Walsh, 1992), or transboundary impacts such as climate change and GHG emissions (Hazell, 2010; Noble, 2017). Project EA is not well equipped to deal with "bigger picture" such as policy and planning issues (Booth & Skelton, 2011c; Doelle et al., 2013; Gibson et al., 2010; Noble, 2017) - issues associated with the nature and pace of development in a region, longer-term land use, resource planning, or Aboriginal title. Yet, such big picture issues are often raised when projects are assessed (Haddock, 2010; Noble, 2017; WCEL & NWI, 2016).

Project EA is usually approval oriented, focused on the docket of regulatory and permitting processes associated with a single project proposal, such as a pipeline, wind turbine, or hydroelectric facility, and not on the legacy effects of past activities, sector-wide land use and development, broader policy issues, or future development that may occur in a specific region (Alshuwaikhat, 2005; Noble, 2017; WCEL & NWI, 2016). EA takes a reactive approach to manage the potential adverse impacts of individual projects and is often criticized for not being proactive in setting directions for resource development (Jay, 2010a; Noble, 2017; Noble & Harriman, 2008) and considering regional-scale resource management issues (Horvath & Barnes, 2004). Thus, expectations about what EA should address often fall short of what it is capable of addressing. As a result, there is often conflict and frustration during the EA process when projects are proposed.

2.4 Research gap

In order to improve project EA for resource development, and manage expectations about what EA can deliver, there is a need to understand the typical issues that emerge in EA and identify which ones can be addressed through project review and which may be beyond the scope of what EA can deliver – issues that can often create unnecessary conflict and delay (Booth & Skelton, 2011b; Chetkiewicz & Linther, 2014; Gibson et al., 2010; Haddock, 2010; Noble, 2017; Udofia et al., 2017). Strategic EA refers to EA of policy, plan or program issues (Alshuwaikhat, 2005), and incorporating environmental considerations into the highest levels of policy, planning, and land use development decision making (Noble et al., 2013; Sadler, 1996). Strategic approaches recognize the need to identify and resolve 'strategic issues' (such as cumulative effects, policy, rights-based issues, and land use) before projects are proposed, rather than on a project-by-project basis (Sadler, 1996). Strategic EA is intended to address those issues that are beyond the scope and capacity of project proponents (Noble, 2017) before individual projects are designed, proposed and assessed (Doelle & Critchley, 2015). This approach will allow proponents to avoid problems they simply cannot resolve, and thus streamline the project EA and regulatory process. Doelle & Critchley (2015) suggest that numerous issues raised repeatedly at the project EA level could be partly or completely addressed within the context of a strategic EA.

The problem, however, is that there is little known about whether EA provides enough support in terms of planning for, investment in, and successful management of renewable energy transition. At the most basic level, there is a need to know which issues and concerns typically emerge when renewable energy projects are proposed, and understand which ones are within the scope and scale of project EA and which are beyond the scope and capacity of the project review process. There is limited direction in scholarship and policy as to what issues are appropriately within the scope of project EA process, versus what issues are best suited to more regional, strategic or policy-level processes. Understanding these issues, improving the scope and focus of project EA, and identifying those issue that need to be addressed more proactively and outside the scope of project EA is essential to improving the role of EA as a facilitator of renewable energy transition (e.g. Larsen et al., 2018; Noble, 2017; Smart et al., 2014).

Chapter 3
RESEARCH METHODS

This research aims to understand, and mobilize knowledge about, the recurring issues and concerns that emerge during EA reviews for renewable energy projects. To do so, the study will focus on wind energy, one of fastest growing energy sources in Canada and internationally (CANWEA, 2020; Dai et al., 2015). Globally, wind energy is considered an important actor to meet future energy demand and reduce GHG emissions (Ackermann & Soder, 2002; Saidur et al., 2011).

3.1 Wind energy sector

Canada is endowed with vast areas with excellent wind resources, with significant potential to produce wind generated energy (Natural Resource Canada, 2018). In recent years, Canada has experienced dramatic growth in wind power installation, and it is expected to continue to increase because of government initiatives and the growing interest of electricity producers (Natural Resource Canada, 2018). Wind energy is a relatively low-cost option for new electricity generation in Canada, and currently supplies approximately six per cent of electricity demand (CANWEA, 2020). Wind energy installed capacity in Canada has grown by an average of 20 per cent per year over the past decade, which places Canada ninth in the world for total installed wind energy capacity (CANWEA, 2020). The Pan-Canadian Wind Integration Study (PCWIS) found that Canada can generate more than one-third of its electricity from wind energy in a reliable and cost-effective way (GE Energy Consulting, 2016). At the end of 2018, Canada gained 12,816 MW of wind energy capacity from 299 wind farms (CANWEA, 2020).

3.2 Study area

The focus of the research was wind energy developments in Canada's four western provinces - British Columbia, Alberta, Saskatchewan and Manitoba. Western Canada is showing prominent progress to increase its proportion of energy from renewable sources. Government policy commitments to renewable energy, declining technology costs, and increasing environmental awareness along with plenty of renewable energy resources provides this region with an opportunity to be a leader in Canadian renewable energy and in the transition to a green energy future. Geographically, Canada's western provinces are well suited for wind power production.

The windswept belt of America's central plains stretches into Alberta, Saskatchewan and Manitoba (Farris, 2017).

IEA (2017) projected that Canada will install nearly 6.9 GW of new wind energy capacity from 2017 to 2030, based on current policies and a market for new wind power that is shifting westward to Alberta and Saskatchewan. The *Climate Leadership Plan* (2015) and Renewable Electricity Program (AESO, 2016) of Alberta, the *Clean energy Act* (2010) and *Climate Change Accountability Act* (2007) of British Columbia, Saskatchewan's renewable energy target (2015), and Manitoba's *Clean Energy Strategy* are some examples of government support to promote wind energy growth in these provinces. Alberta and Saskatchewan have also contracted to add significant wind energy capacity at record low prices (Froese, February 2019).

British Columbia also has significant offshore wind energy potential, comparable to its hydroelectric power, with some onshore wind resources (Barrington-Leigh & Ouliaris, 2017). Wind energy could help to meet the objectives set out under the province's *Energy Plan* and *Climate Action Plan*. It is reported in the Canadian Wind Energy Association's *Wind Vision 2025: Strategy for British Columbia*, that the province has enough potential wind energy sites to produce almost 5,250 MW of power that could be harnessed for less than $105 per MW by 2025 (Canadian Wind Energy Association, 2008; Farris, 2017). British Columbia started commercial wind energy development in 2009 and now has 713 MW of installed wind energy capacity and nine wind firms, fulfilling 4% of its electricity demand (CANEWA, 2020). Electricity generation capacity from wind sources grew from 0% in 2005 to 2.8% in 2016 (Canada Energy Regulator, 2018).

The Government of Alberta indicates that it is committed to add 5,000 MW of renewable electricity by 2030 as a part of its *Climate Leadership Plan* (Government of Alberta, 2018). In 2016, Alberta generated 12.3% of its electricity from renewables and wind was the largest source. Wind energy in Alberta experiences significant growth from 1.1% to 6.9% between 2005 and 2016 (Canada Energy Regulator, 2018). The Renewable Electricity Program under *Climate Leadership Plan* has triggered five new wind power projects with a combined value of $1.2 billion, expected to generate about 760 MW of electricity (Trusted Energy Intelligence, 2018). This program is part of the Government of Alberta's commitment to 30 per cent renewable electricity by 2030 (AESO, 2016), and to support 5000 MW of new electricity development in Alberta (Government of Alberta, 2018). This commitment and plan of adding 5000 MW renewable energy is an important market opportunity for wind energy development in Alberta (Delphi Group, September 2017). Experts predict that 95% of this additional capacity could be extracted from wind energy (Delphi Group, September 2017). The provincial government also committed to phase out all coal-fired electricity generation by 2030, replacing one-third of its coal generating capacity with renewable energy (Government of Alberta, 2019). The year 2017 was a record-breaking year for wind energy in Alberta. Wind energy became the lowest-cost option for new electricity generation (Government of Alberta, 2018b). Now, Alberta has the third largest installed wind energy capacity in Canada with almost 1,685 MW of installed generation capacity (Canada Energy Regulator, 2018; CANWEA, 2020). The Black Spring Ridge project of Alberta is the largest energy investment in western Canada with 300 MW installed capacity (Canada Energy Regulator, 2018).

The Saskatchewan Power Corporation (SaskPower) set a target to increase renewable energy generation capacity to 50% by 2030 and has subsequently developed plans for future procurements of renewable energy projects (Saskatchewan Ministry of Environment, 2018). This provincially-owned utility is relying mostly on wind power to achieve its renewable energy target, with an expectation to increase wind power generation to 30% of the energy mix by 2030 (Harper et al., 2016). The *Prairie Resilience: A Made-in-Saskatchewan Climate Change Strategy*, conveys the province's commitment to renewable energy (Government of Saskatchewan, 2019). It sets a target to add 1,600 MW of wind energy to its electricity supply mix over the next 15 years (PR Newswire, 2016, Nov 1). Renewable sources contribute almost 25% of the province's present energy generation capacity, but with only 5% from wind (Harper et al., 2016). From 2005 to 2016, wind power in Saskatchewan had a growth from 0.5% to 3.0% (Canada Energy Regulator, 2018). At present, Saskatchewan has six wind farms with a combined installed capacity of 241 MW (Canada Energy Regulator, 2020; CANWEA, 2020). Recently, three large-scale wind energy projects have been proposed including the 200 MW Golden South Wind Energy, the 177 MW Blue Hill Wind Project, and the 200 MW Spring Lake Wind Project (Canada Energy Regulator, 2020; Government of Saskatchewan, 2018; SaskPower, 2019).

In 2016, Manitoba produced 99.6% of its electricity from renewable sources, which was the second highest share of renewable generation in Canada, though this was primarily hydroelectricity (Canada Energy Regulator, 2018). However, the province does have four wind energy facilities with 258 MW of installed wind energy capacity, fulfilling five per cent of the province's electricity demand (CANWEA, 2020). Wind energy became the fastest growing electricity source in Manitoba, with a growth from 0.1% in 2005 to 2.4% in 2016 (Canada Energy Regulator, 2018). The Government of Manitoba argues that it is well-positioned to develop wind energy as it has good access to transmission lines to distribute and export power (Government of Manitoba, 2018).

3.2.1 Environmental assessment requirements

EA is conducted for identifying and managing the potential impacts of any development project across Canada under provincial or territorial government and the federal government. Government determines which proposed projects should proceed through EA and under which terms and conditions. British Columbia has a project-threshold approach to determine which project will undergo EA. According to BC *Environmental Assessment Act (2002*), EA is applied in British Columbia to certain sizes of certain industrial projects (exceptions include Ministerial designation on a discretionary basis and proponent's to voluntarily "opt in") (SBC 2002, c. 43). In British Columbia, a regulatory agency of provincial government, Environmental Assessment Office (EAO) manages the EA processes, and an advisory working group is formed involving provincial, federal and local government staff and representatives of potentially affected First Nations that provides technical advice to EAO about potential adverse impact of any proposed project, reviews the proponent's application and identifies opportunities for public input (Haddock, 2010). EAO is responsible to ensure that the consultation and engagement with Indigenous people is adequately fulfilled. Typically, EAO requires proponent to provide two public comment periods. In the pre-application phase Indigenous group, all levels of government and public are invited to decide what should be considered in the assessment, and in the application review stage, public and others are invited to identify potential environmental, health, economic, social, or heritage effects associated with the proposed project (BCEAO, 2018). All issues raised by government, Indigenous group, public and other interests are tracked and responded by the proponent. EAO posts project descriptions, draft application information requirements, application and tracked issues and proponent responses on EAO's Project Information & Collaboration System (or EPIC) to facilitate public consultation. EAO submits an assessment report including proponent's application to provincial ministers for making decision whether to approve the project.

Albertan industrial activities are regulated under some major acts, two of which are *Environmental Protection and Enhancement Act* (EPEA) and the *Hydro and Electric Energy Act*. EA process is one of the regulatory steps under EPEA and *Environmental Assessment (Mandatory and Exempted Activities) Regulation* of this act determines which projects are subject to or exempted from the EA process of this province (Hearn, 2018). It starts with submissions of project initiation material to EA director by proponent to determine if the project requires EA or not. Proponent may require submitting a screening report to EA director for discretionary projects (RSA E-12, 2000). If an EA is required, proponent prepares proposed terms of terms of reference to set scope for Environmental Impact Assessment (EIA) report and First Nations consultation plan where necessary (AESRD, 2013). Completed EIA report is reviewed by Environment and Sustainable Resource Development (ESRD) involving multi-disciplinary, integrated team of provincial experts and referred to the Board or Minister to make a public interest decision (AESRD, 2013). Proponents are required to allow comments from public and other government agencies on screening report, proposed terms of references, final terms of references and EIA report (Alberta Regulation 112/1993, 89/2013). Alberta Environment and Parks (AEP) and the Alberta Utilities Commission (AUC) (under *Hydro and Electric Energy Act*, *RSA 2000, c H-16*) have also regulatory authority to issue provincial environmental approval for new power facilities and changes to existing ones (CANWEA, 2020). AEP maintains a single register of all EA activity information on a website (Government of Alberta, 2020).

In Saskatchewan, proponent of any development project is required to conduct an EA that starts with submission of application with a technical proposal of project for screening to the EA Branch of the Ministry of Environment (the ministry) (EA Branch, 2014). Proponents are expected to engage with local community during preparation of project proposal (McMaster et al., 2020). If it is determined from the screening process that an EA is required, proponents are asked to prepare scoping document (Terms of References) that guides the EA process. Upon completing necessary studies, proponents submit an Environmental Impact Statement (EIS) to the EA branch. A technical review is conducted engaging various academic resources, federal government departments, local governments on it. EIS and technical review comments are released on ministry website for public review and comments. If any development action has potential to impact on Treaty and Aboriginal Rights and pursuits of traditional uses, the ministry is responsible to consult with First Nations and Métis communities before making any decision on project (EA Branch, 2014).

The Environment Act (S.M. 1987-88, c. 26) of Manitoba requires EA licensing for all developments in this province those are outlined as development under the *Classes of Development Regulation* (Manitoba Regulation 164/88). Environmental Approvals Branch (EAB) regulates this licensing process. At the beginning of the process, proponents are asked to submit a complete Environment Act Proposal (EAP) including cover letter, EAP form, reports/plans to supporting the EAP and application fee to the EAB. Proponents are encouraged to consult with related department, affected public, First Nations and other interests early in the process prior to finalizing the proposal (Manitoba sustainable development, October 2018). EAPs are made available for public review and distributed to Technical advisory committee (TAC) consisting provincial and federal government specialists for technical review. Proponents prepare an EIS and submit to EAB. EIS and any guidelines for EIS are also reviewed by public and TAC. Public meeting may be held, and public hearing may be conducted upon recommendation of EAB. EAPs, EIS Guidelines, and EISs and all public and TAC comments are place on online public registry of the province. Either director of EAB or Minister is responsible to decide on project licensing.

Although EA is the primary instrument for assessing the impacts of wind energy projects in Canada, not every wind energy project trigger EA requirements or undergoes a full EA when requirements are triggered (Hearn, 2018). Requirements for EA vary depending on project size or location and province. Typically, wind energy projects are assessed under provincial or territorial jurisdiction - except for rare cases where a federal assessment might be triggered under *the Impact Assessment Act* (*IAA)* (McMaster et al., 2020). Wind energy projects subject to the federal Impact Assessment Act would normally be those located in an offshore area and having 10 or more wind turbines, or located in a national park or protected area (wildlife area, migratory bird sanctuary), or involve any decision from a federal authority (S.C. 2019, c. 28, s. 1). In most cases for onshore wind energy, provincial or territorial governments maintain control over projects occurring within their jurisdiction (Hearn, 2018).

Each province has its own EA system established under provincial laws and regulations, and thus requirements of EA for wind energy projects varies across the country (Table 1). In British

Columbia, Alberta, and Manitoba, for example, EA for wind energy projects is triggered based on project size (e.g. number of turbines or generation capacity) (McMaster et al., 2020). . These provinces have chosen their specific EA thresholds based solely on power generation capacity, but the generation thresholds those are not specific to wind energy developments and apply to all electricity generating projects (McMaster et al., 2020). For example, power plants in British Columbia with a rated nameplate capacity of 50 MW or more electricity are subjected to EA requirements. In Alberta, all energy generating facilities, excluding facilities with less than 1 MW power generating capacity, trigger an EA screening and then the Alberta Energy Regulator decides if a full EA is required or not. All electricity generating facilities in Manitoba are subject to EA regulation if their designed maximum capacity is more than 10 MW. In Saskatchewan, in contrast, there is no specific threshold to determine the need for EA, rather the need for assessment for all projects is determined on a case by case basis by using indicative guidance as screening criteria (McMaster et al., 2020).

Table 3.1: EA Legislation and requirements to trigger EA in Western Canada

Province	British Columbia	Alberta	Saskatchewan	Manitoba
Environmental Assessment Legislation	*Environmental Assessment Act (EAA)* (SBC 2002 c.43)*	*Environmental Protection and Enhancement Act (EPEA)* (RSA E-12, 2000)	*The Environmental Assessment Act (EAA)* (S.S. 1979-80 c.E-10.1)	*The Environment Act* (SM 1987-88 c.26)
Environmental Assessment Requirement of Wind Turbines	A rated nameplate capacity of ≥ 50 MW of electricity	≥1 MW (Discretionary Activity)	Case by case basis	>10 MW
Formal Public Participation Opportunities	Required	Required	Required	Required
Formal Public Participation Stages	Draft application information requirements and/or Valued component framework (Pre-application stage) Application for EA certificate (Application review stage)	Proposed Terms of Reference Final Terms of References Final Environmental Impact Assessment (EIA) report	Environmental Impact Statement (EIS) Technical review comments (TRC)	Environmental Act Proposal (EAP) (including an Environmental Assessment report) EIS Guidelines EIS **Public meeting **Public hearing
Act or regulations allowing Public Participation	*Section 11 of the Environmental Assessment Act (SBC 2002, c. 43) (BCEAO 2018)* *Public Consultation Policy Regulation (BCEAO 2018)* *Common Law Guiding First Nation Consultation (BCEAO 2018)*	*Environmental Assessment Regulation* (112/93; 89/2013)	Section 11 of *The Environmental Assessment Act* (1979-80, c.E-10.1, s.11; 2010, c.11, s.15)	*Licensing Procedures Regulation* (E125 – M.R. 163/88) Section 6 of *The Environment Act* Environmental Assessment and Licensing under *The Environment Act* (Manitoba Sustainable Development, 2018)

***** BC Environmental Assessment Act was updated and replaced by Environmental Assessment Act 2018 (SBC 2018, c. 51) that came into force in December 2019.
****** Discretionary provision

3.3 Methods

Document analysis was the primary method in this research. Bowen (2009) describes document analysis as a systematic procedure for reviewing or evaluating documents—both printed and electronic. It engages in data examination and interpretation to elicit meaning, gain understanding, and develop empirical knowledge (Bowen, 2009; Schwandt, 2007). Document analysis is a useful tool to identify core elements of written communication by organizing information into categories through content analysis (Curry et al., 2009). Document analysis is a common method in EA research, and has been used by many EA researchers as a means to understand the state of practice (e.g. Fischer, 2001; Geißler et al., 2013; Kirchhoff et al., 2011; Leung et al., 2015; Noble and Hanna, 2015; Partidario, 1996). For instance, Noble and Hanna (2015) applied this method to understand the state of EA research relevant to Arctic communities and identify key gaps and opportunities in EA research. Luke and Noble (2019) conducted a document analysis of impact statements in the British Columbia liquefied natural gas sector to examine the practice of climate change assessment in project-based reviews. Larsen et al. (2018) conducted an analysis of EA reports and written hearing statements submitted during public hearing processes to investigate the role of EA in conflict regarding renewable energy projects.

There are several documents filed as part of a typical EA application process, including project assessment guidelines or terms of reference, the proponent's impact statement, permitting decisions, and sometimes approval conditions such as mitigation requirements or monitoring protocols (Noble, 2015). Formal opportunities for public participation in the EA process varies by jurisdiction, but a consistent principle is the opportunity for comment and written submissions on the proponent's impact statement – including mitigation measures. For simplicity, comments typically received during the EA process are from four broad groups: i) government, including provincial or federal government agencies, organizations and regulators; ii) environmental non-government organizations (NGOs), such as lobby or special interest groups; iii) Indigenous groups, which may include First Nations organizations, councils, governments, community members or legal authorities formally representing their interests; and iv) all other interests, ranging from individuals not representing any specific organization or entity to individuals commenting on behalf of private sector enterprise. As such, the comments and concerns submitted during an EA process can be wide-ranging, and include very technical matters related to the proponents' impact analysis, concerns about the project's potential impacts and mitigation strategies, matters relating to regulatory processes and compliance and fairness, to broader land use and policy issues that may not be related to the specific project at hand. These written comments form part of the formal, public record of the project's EA.

To identify re-curing issues raised during wind energy project development EAs, a document analysis was conducted. A list of wind energy projects is available on the CANWEA website, however many of these projects may not have been subject to EA. Attention was focused on those projects with documentation available in public EA registries. An EA registry is a basic tool that serves as a documentation and information system to provide public access to EA information, reporting, and decision-making processes (Odparlik & Köppel, 2013). It can also support public participation in EA through the provision of, and access to, information about a project and access to the comments and issues raised by the various actors engaged in EA. Most Canadian provinces, including provinces in western Canada, use EA registries as the main way to provide public access to EA information (Hanna, 2005).

The EA registry of each province was searched to identify wind energy projects subjected to EA. To limit the analysis, only EA application submitted within the last 14 years, between 2005 and 2018 were considered. Accessing project documents was not easy in many cases, as not all registries were clearly organized or included complete project information. Accessing some project documents required submissions of *access to information* requests. In some cases, requests were met with no reply or reply after a long waiting period. For some projects, requests were met with further direction to obtain materials – sometimes directing the inquiry to the project proponent. Where EA documentation was not available on the registry, the project proponent was contacted to secure the EA reports. Some proponents were not inclined to provide complete documentation, and in some cases it was made available only in paper form. A total of 17 wind energy project EAs were secured from this process for the western Canadian provinces. A preliminary review of 17 EAs found that one project did not include any record of public submissions or comments from governments or other stakeholders. Given that the focus of this research was on the identification of issues raised in comments and submissions to the EA process, the final sample selected for analysis included 16 wind energy projects (Table 2).

Table 3.2: Sample of wind energy projects included in this research

Name of the project	Province[1]	Year (Decision (approval or rejection) was made to the project)	Project capacity (MW)	Number of turbines
Bear Mountain Wind	BC	2007	102	34
Thunder Mountain Wind	BC	2009	320	159
Dokie Wind Energy	BC	2009	144	48
Quality Wind	BC	2010	142	79
Cape Scott Wind Farm	BC	2012	99	55
Meikle Wind Energy	BC	2014	179	68
Ghost Pine Wind Farm	AB	2010[2]	81	54
Wintering Hills Wind Power	AB	2010	88	55
Halkirk Wind	AB	2010	149	83
Oldman 2 Wind Farm	AB	2010	46	20
Blackspring Ridge Wind	AB	2011	298.80	166
Bull Creek Wind	AB	2015	29.15	17
Chaplin Wind Energy	SK	2016	177	59-118
Blue Hill Wind Energy	SK	2018	177	56
St. Leon Wind Energy	MB	2007 (St. Leon I) 2010 (St. Leon II)	120.45	73
St. Joseph Wind Energy	SK	2009	138	60

[1] BC= British Columbia; AB= Alberta; SK= Saskatchewan and MB= Manitoba
[2] Ghost Pine Wind Farm got provincial approval in 2010 and Federal decision in 2011

Three stages of coding were conducted, with each stage coding up to a larger or more aggregate output. First, all written submissions and comments included in EA documentation for each project were reviewed. The focus was on identifying and extracting the specific concerns raised in each submission or comment. At the first stage of coding, all comments and concerns from each of the reviewed projects were coded by using inductive coding (i.e. an open coding approach) and documented (Chandra and Shang, 2019; Creswell, 2002). These coded comments and concerns were categorized according to: i) the specific concern raised (e.g. impact on a specific water body, impact on a particular bird species, excessive noise from turbines, or a concern about a specific policy or legislation); ii) who made the comment or raised the concern (e.g. affected public, ENGO, government agency); and iii) frequency (i.e. how many times the concern was raised). Frequency was determined for each concerned group with respect to each project. The information was organized in a spreadsheet by project, concerned group, and frequency raised with respect to both the concerned group and each project.

Second, specific concerns were coded into core "issues," whereby each issue is comprised of multiple, specific concerns. This new category or code represents the important (and recurring) issues raised in comments submitted across all projects (e.g. impact on terrestrial environment, noise, impact on recreation, impact on agriculture, setback distances, loss of property value, cumulative impacts). These issues were then mapped to each project, by province, concerned group, and assessed based on frequency of each issue being raised.

Third, issues raised were summarized in a hierarchical coding frame, where 11 categories were identified that captured broad themes (e.g. impact on natural ecosystems, population and human health, land use). The frequency of all issues categorized under each broad theme was then determined. To understand these recurring issues and themes, literature from Canada and other countries was reviewed to gauge which issues are typically discussed within the scope and scale of project level assessments and which are the focus of more regional, policy, planning, or strategic assessments. For example, impacts of a proposed project on local water resources, fish and fish habitat, on terrestrial mammals, and birds and bats are some of the 'typical' issues generally assessed in project EA (Ferrer et al., 2012; Fox et al., 2006; Garrard et al., 2015; Keith et al., 2008; Lusseau et al., 2012; Madders & Whitfield, 2006; Pérez Lapeña et al., 2010; Volkovaia, 2019; Zwart et al., 2015), and thus often within the scope of what project proponents are expected to assess – usually as identified in their EA terms of reference. Identifying these issues and comparing them to the related literature can provide insight to what is 'reasonably expected' under project review. In contrast, other literature (e.g. Baker & Mclelland, 2003; Booth & Skelton, 2011c; Doelle & Critchley, 2015; Fidler & Hitch, 2007; Galbraith et al., 2007; Gunn & Noble, 2011; Noble, 2017; Tollefson, & Wipond 1998; Udofia et al., 2017) have argued that many issues raised in project reviews are beyond the scope of project assessment – for example, issues such as land use planning, climate change, cumulative effects or benefits sharing and royalty regimes.

3.4 Positionality and subjectivity

Identities of both researchers and participants may also influence research process (Bourke, 2014; England, 1994). document analysis of this research focused on issues and concerns raised during wind energy project EA. Throughout this document analysis, from the review of written comments and submissions of different stakeholders to the coding of raised issues and concerns, positionality of researcher studying renewable energy issues as an "outsider" might bring personal biases to the research. As an international student coming from a developing country researcher's initial understanding of renewable energy issues were shaped by literature with no practical experience of wind energy project. Researcher started this study with the initial motivation that renewable energy transition is necessary to manage social and environmental problems associated with fossil fuel usage. Researcher was also influenced by an ethical perception of researchers that research should also focus on finding ways to change problematic situation rather than only identifying and analyzing (Cloke, 2004; Roger et al., 2012) Therefore, she looked into literature and EA documents with an aim to identify problems and solutions associated with renewable energy development. Before starting to investigate EA comments, she had an assumption of general support for renewable energy and theoretical knowledge about impact of renewable energy development. However, researcher's initial understanding did not include any pre-assumption of what types of issues and concerns are generally raised during wind energy EA applications.

There are some potential flaws in applying document analysis as primary method of this research to determine raised issues and concerns from EA documents. Initial concern for this research with applying this method was ensuring the quality of documents. Documents analysis may have some inherent challenges or gaps if the studied documents are incomplete, biased selection, insufficient, or not retrievable or not easily accessible (Bowen, 2009). This study also met with these challenges as EA documents required for this study were not easy to access and, in some cases, documentation was incomplete. interpreting and categorizing issues raised in written EA comments or submissions may miss any hidden meaning or shading of concerns which is not pertinent in the text. Another concern with document analysis for this research is "unwitting evidence" or latent contents of the documents (O'Leary, 2014). In this case, latent content may include any style, tone, feeling, or meaning of the issues raised that are not written in the document. Researcher may miss these nuances of the concerns raised while interpreting and categorizing issues from the documents.

Chapter 4
RESULTS

This chapter presents the results of document analysis. The document analysis examined comments and submissions to EA process for 16 wind energy projects and identified issues and concerns raised during wind energy project EAs. Issues identified from document analysis are presented in table and chart in this chapter with in-depth discussion in chapter 5.

4.1 Issues raised in EA submissions and comments

A total of 50 issues were documented from comments and submissions to the EA process. **Table 4.1** presents the first 24 of these issues based on their rank order for frequency of occurrence. These issues were raised frequently in different projects and reflect the concerns of each of the various actors involved in the EA processes. The most frequently raised issues and concerns were related to impacts to the terrestrial environemnt, raised 141 times in total and raised in all projects reviewed. This was the only issue raised across all projects. Issues related to noise, impacts on other tenure holders or land usages, setback distances, and visual impacts are other examples of frequently recurring issues across projects, identified in submission and comments from at least 8 projects. In contrast, issues such as road and traffic safety were also found to common across 8 of the projects, but raised only 12 times in total – suggesting that it is a *typical* concern but perhaps not a frequently raised one by multiple interests. Other issues, for example those related to concerns with government policies or legislation (raised 8 times, but only for one project), potential technology related hazard (raised 12 times, but only in 2 projects), and social cumulative impacts (raised 11 times, but only in 2 projects), appear both *less typical* and *less frequent* when wind energy projects are proposed.

Table 4.1: Issues raised in EA comments and submissions for the sample of 16 wind energy projects

Issues raised in EA comments and submissions	# of projects in which the issue was raised					Total frequency issue was raised, all projects
	BC (6)	AB (6)	SK (2)	MB (2)	Total	
Impact on terrestrial environment	6	6	2	2	16	141
Noise	3	6		1	10	76
Impact on other tenure holder/license/land usage	5	4		2	11	55
Setback distances	3	4	1		8	55
Visual impact	2	5		2	9	46
Flickering/strobe light effects/shadow/light pollution	1	5		1	7	45
Loss of property value	1	3		2	6	39
Impact to aquatic environment	6				6	39
Adequacy of consultation process	2	4	2	2	10	35
Impact on recreation	5				5	31
Selection of project location	2	4	2	2	10	31
Employment opportunity	4	3		1	8	27
Impact of project (other than noise and light) on health	1	4		1	6	20
Biophysical cumulative impact	4	3			7	13
Benefit from project to community (other than employment opportunity)	2	1			3	13
Potential technology related hazard	1			1	2	12
Impact on roads and traffic safety	4	2	1	1	8	12
Social cumulative impact	2				2	11
Compensation for financial and structural disruption	1	3	1		5	11
Concern with government policies or legislations	1				1	8
Impact on agriculture		3	1	1	5	8
Traditional land use (TLU) assessments	3	2			5	8
Access to traditional use (TU)areas	3				3	8
Chemical hazards/ contamination	2				2	8

4.1.1 Most frequently raised issues

Table 4.2 presents the top 50% of issues raised based on the number of times it was identified across all projects and by all actors, and the specific concerns associated with each issue – where applicable. The total frequency of all documented concerns is 848. The top 50% (more accurately 53.18) of concerns raised across all projects, based on rank order for frequency, is captured by only 7 issues. Each of these is described briefly, below.

Table 3.2: Most frequently raised issues (top 50% based on frequency) and specific concerns in comments and submissions to the EA process for the sample of 16 wind energy projects

Issues	Specific concerns	Frequency
Impact on terrestrial environment	Impact on wildlife Impact on birds and bats Impact on forest & natural vegetation Impact on native prairie Impact on soil Impact on cattle Loss of ecosystem	63 45 31 7 2 1 1
Noise	Noise of project construction and operation	76
Impact on other tenure holder/license/land usage	Other utilities, licensees and infrastructures Industrial land use	33 22
Setback distances		55
Visual impact		46
Flickering/strobe light effects/shadow/light pollution		45
Loss of property value		39

4.1.1.1 Impacts to the terrestrial environment

The most frequently raised issue related to impacts to the terrestrial environment, identified 141 times in submissions and comments by all actors across the full sample of EAs reviewed. Within this category, concerns were most often related to project-specific impacts to wildlife, birds and bats, and forest and natural vegetation. Concerns related to impacts to wildlife included potential for increased human or predator presence resulting from the increased and upgrading of surface access, impact of construction activities, increased road and traffic, blue listed plant and animals and so on. A public comment on the Bear Mountain project, for example, indicates: "with unlimited access on high-grade roads, the biodiversity, habitat and environment of Bear Mountain will be opened up and will become more fragile". Typical concerns were also expressed regarding bird fatality and migration. The Canadian Wildlife Service, for example, raised concerns about the Cape Scott project, noting: "One of the biggest concerns regarding the impacts of wind power projects is the potential for significant impacts on birds and bats. Although Sea Breeze Energy Inc. may feel these impacts are slight, this is a big concern for Canadian Wildlife Services…". Indigenous people often expressed concerns about the introduction of invasive plant species in the project area, such as for the Meikle project, and the impact on native prairie or disturbance to native prairie grassland and impact on soils.

4.1.1.2 Noise

Noise produced by project construction and operation was the next most frequently identified concern, raised 76 times by actors across all reviewed EAs. One typical concerns from public for St. Josef Wind Farm indicates, “I have not signed up for wind power because of sound problem”. Another comment from government agency for St. Josef Wind Farm indicates, “"due to uncertainty in sound prediction there is possibility that the Leq (Equivalent Continuous Sound Pressure Level) at the receptor may exceed 45 DBA". Stakeholders sometimes identified specific aspects noise impacts, including aerodynamic noise, low frequency noise, and vibration. Others raised concerns that noise from wind turbine generator could have serious impacts on human health. For example, one person stated his concern for Bear Mountain wind project, “"I am very concerned that the noise from wind turbines will cause my headaches to become more frequent or more…".

4.1.1.3 Impact on other tenure holder/license/land usage

The third most frequently raised issue was related to impacts on other land users, specifically other tenure holders or licensees, which was identified 55 times in total across all 16 projects. Concerns raised in regarding land use were twofold: first, concerns about impacts to or interference with other industrial land use; second, concerns about land accessibility and use by utilities, licensees or infrastructures other than industry. Other land uses raised included grazing tenure holders, mining tenure holders, guide-outfitting license holders, aerial application (i.e. precision agriculture fungicide and herbicide application) business license holders, and tree farm license holders. For example, Kamaka Resources Company (a mining tenure holder) expressed concerns about land use by the Cape Scott Wind Farm affecting their mineral title in the project area. Fox Coulee Aviation Inc. (an aerial application business) submitted their concerns for the Wintering Hills Project stating: “We're certain the proposed wind turbine development will negatively impact our ability to service. Based on past years, the economic damage to our bottom line would be in the neighbourhood of $ 50 000.00 to $100 000.00 annually producers in these areas”. Concerns about land accessibility and use by utilities, licensees or infrastructures other than industry included impact on electricity distribution services, impact on existing pipeline rights-of-way, potential conflict with land tenure holders, potential loss of woodlot license holder, impact on licenses trapper’s livelihoods, and impact to irrigation systems.

4.1.1.4 Setback distances

Concerns about setback distances often focused on separation distances desired between projects and residential areas or property lines and natural resources. For example, one public comment for the Bear Mountain project questioned: “why does this project have to be so close in proximity of the general population?” Alberta Utility Commission (AUC) raised concerns with setback distances, but for wetlands. AUC specifically asked the proponent to confirm that all setback distances applied to locate turbines are measured as the distance between the edge of the feature (e.g. wetland or raptor nest) and the tip of the blade when closest to that feature, and also asked to confirm 100 m setbacks from wetlands as specified by provincial guidelines to determine all proposed turbine locations. One comment come from a First Nation for the Meikle project, BC, indicates that: “preference would be for at least 50 m buffer zones from all wetlands and riparian zone”. In total, issues related to setback distance were raised 55 times across the full sample of EAs reviewed.

4.1.1.5 Visual impact, flickering or light pollution, and loss of property value

Other frequently raised issues were related to visual impact, flickering/strobe light effects/shadow/light pollution, and loss of property value, identified 46, 45 and 39 times respectively across the full sample of EAs reviewed. Some people commented on visual impact in the following ways: “at the end, the only real lasting impact can be constructed as negative is visual” (Bear Mountain project, BC); and “aesthetically, the area will be disaster … the tower will dominate the view…” (St. Josef project, MB). Concerns raised often with “shadow flicker” effect were associated with wind turbine blade rotation, which were identified as a particular health concern by some people; other light issues included nighttime lighting. The last of the most frequently identified issues were concerns about a potential decrease of land or property value due to project development. For example, a public comment to the Bear Mountain project indicated: “A local realtor has informed some of us that our property will definitely devalue. Currently we have a beautiful, unobstructed view of Bear Mountain". Another submission expressed concern about St. Josef project, MB: “fewer people want to live in an industry area than now, thus making the sale of a home in project area, who covers the loss of property value?"

4.1.2 Less frequently raised issues

Table 4.3 presents all other, less frequently identified issues raised in submissions and comments from government agencies, public, NGOs and Indigenous groups. There are 26 issues, each of which was identified 7 times or less across all submissions and comments by all actors. Most of these issues were about impacts to archaeological resources, cumulative impacts, chemical hazards or contamination, whether wind turbines were a sufficient solution to meeting GHG reduction targets, expressed different preferences on energy form, impacts on Indigenous TU areas and resources, concern with credibility of EA process, impact on aboriginal treaty rights, dust or fugitive emissions, concerns with viability of wind energy and impact on protected or sensitive areas.

Table 4.3: Less frequently raised issues in comments and submissions to the EA process for the sample of 16 wind energy projects

Issue	Frequency	Issue	Frequency
Impact to archaeological resource	7	Impact on microwave communication and radar application	3
Cumulative impacts (other, not specified)	7	Impact on air navigation	3
Effectiveness of wind energy as a viable option for GHG reduction	7	Concern with export/import of power	3
Different preferences on energy form	7	Concern with timeliness of EA process	3
Concern with credibility of EA process	6	Concern with rules and laws	3
Impact on Treaty rights	6	Concern related with meteorological tower	2
Impact on Indigenous TU sites/resources	5	Concern related with competition	2
Viability of wind energy (cost, resource, generation amount)	5	Social effects (unspecified)	2
Impact on atmospheric environment (Dust/impact on air quality)	5	Impact of ground disturbance	1
Impact on protected/sensitive areas	4	Impacts to other land use (unspecified)	1
Need for benefit agreement negotiation	4	Adverse impacts to local businesses/suppliers	1
Increased natural hazards	4	Climate change (unspecified)	1
Concern with tax and revenue	3	Supply source for aggregate/base materials	1

Issues related to archaeological resources included potential impact on traditional archaeological features or sites, and heritage or historical resources. Potential chemical hazards or contamination mentioned in submissions and comments include acid rock drainage, mineral leaching, and fertilizer usage and herbicides application. A specific concern raised about the Bear Mountain project was that the project would not sufficiently reduce GHGs, questioning the amount of GHGs that would be reduced from total annual Canadian emissions – “Not theoretical reductions, but actual reductions that would result from decreased uptime or permanent shutdown of coal or oil/gas fired electric generating power plants”. Some of the comments raised were about preferred energy options, with some expressing preference for increased hydro power over wind power. Impact on treaty rights and TU areas and resources were also raised, usually in relation to Indigenous communities’ concerns about wind energy project impacts on hunting rights or practices of traditional and cultural activities.

4.2 Issues raised by concerned group

EA submissions were categorized as either public, government, NGO, or Indigenous group. Among all concerned groups, most issues were raised by the public. Of the 848 total issues raised across all projects, 603 (71.11%) of these were public comments or submissions; 127 (14.98%) were from NGOs; 100 (11.79%) were from government and 18 (2.12%) from Indigenous group. Overall, public also raised the greatest *diversity* of issues. Specifically, the public raised 41 different issues across the sample of projects; Indigenous group raised 28 different issues, Government raised 20 different issues, and NGOs raised the least number of different issues, six, focused primarily on terrestrial environmental impact and recreation. **Table 4.4** presents the most frequently raised issues by concerned group across the sample of 16 projects. Results by concerned group and by jurisdiction are shown in **Figure 4.1**. The issues of greatest concern about wind energy projects, based on frequency of issues raised, is similar across groups.

Table 4.4: Most frequently raised issues (top 50% based on frequency) by concerned group in comments and submissions to the EA process for the sample of 16 wind energy projects[1]

Concerned Group	Issues	Frequency
Public	Impact of noise	66
	Impact on terrestrial environment	63
	Setback distances	48
	Impact on other tenure holder/license/land usage	47
	Flickering/strobe light effects/shadow/light pollution	43
	Visual impact	40
	Loss of property value	39
Government	Impact on terrestrial environment	37
	Impact to aquatic environment	15
NGO	Impact on terrestrial environment	10
Indigenous group	Impact on terrestrial environment	31
	Impact to aquatic environment	10
	Social cumulative impact	9
	Employment opportunity	9
	Traditional land use (TLU) assessment	8
	Access to TU areas	8

[1] Table 6 captures 56.34% of issues raised by public alone, 52% of issues raised by Government alone, 55.55% of issues raised by NGO alone and 56.69% of issues raised by Indigenous group alone.

The most frequently raised issue by government agencies, NGOs and Indigenous group concerned *project specific impacts* on *local terrestrial and aquatic environments*. Public comments were most frequently related to noise resulting from project construction and operation, followed by impacts on terrestrial environments. Public and Indigenous group also often raised some other issues. For example, public comments also concerned setback distances from residences and property and impacts on other land uses; and Indigenous group were often concerned with cumulative impacts on society and culture and employment opportunities.

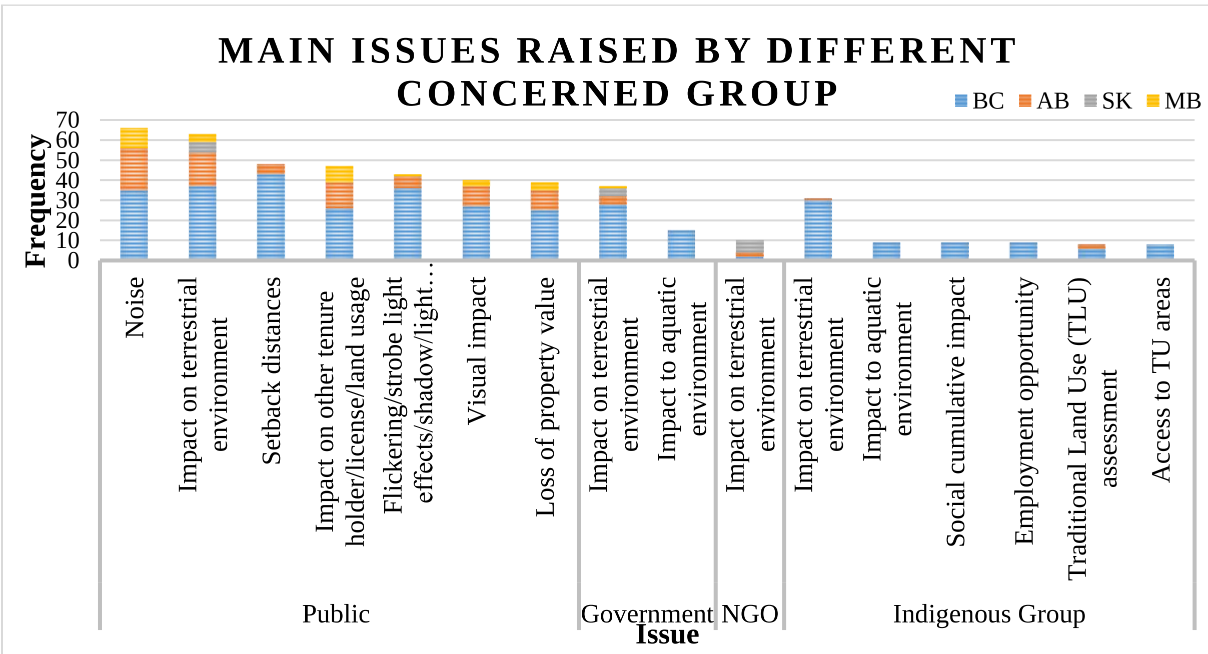

Figure 4.1: Main issues raised by concerned group by jurisdiction

4.3 Issues raised by jurisdiction

Table 4.5 identifies the main issues raised by jurisdiction -BC, AB, MB and SK, across the sample of projects. This is based on the top 50% of all issues raised by all actors in that respective jurisdiction, and in how many projects those issues were raised. The overall frequency of issues raised and the diversity of issues raised was less in SK and MB than AB and BC. The most frequently raised issues in BC were related to project specific impacts on the terrestrial environment, raised for all projects and raised more than twice as often as the next issue of concern. Concerns about impacts to aquatic environments, identified 39 times in comments and submission, was the only other issue raised in all 6 projects. Concerns about flicker and light pollution were also in the top 50% of issues raised in the BC projects, but they were all raised in relation to just one project – Bear Mountain. In fact, more than 80% of all issues raised concerning impacts on recreation, noise (88%), setback distances (91%) and flickering/shadow/light effects (100%), were raised in the Bear Mountain Wind Project.

In AB concerns of noise and project specific impacts on terrestrial environments were the most frequently identified issues and appeared in all 6 projects. Impacts to terrestrial environments was similarly the most frequently raised issue in SK wind energy projects and comprised more than 50% of all issues raised. Concerns related to noise was the most frequently raised issue in MB, raised 11 times in EA comments and submissions, but it was *only* in relation to one of the two project - the St. Josef Wind Farm.

Impacts to other tenure holders and land users was identified as a priority issue of concern only in the AB and MB projects. In the Halkirk project, AB, for example, legal counsel on behalf of EnCana Corporation expressed concerns about future development of EnCana owned mines and minerals on or near the wind project development site. One distribution facility owner (Fortis Alberta) was concerned about potential effects of the Blackspring Ridge Wind Project, AB, on distribution system planning for new infrastructure in the area. Fortis Alberta was also concerned with the project’s proposed collector system potentially causing confusion with Fortis’s distribution facilities. Public, including agricultural landowners or farmers, often raised concerns about loss of aerial application (e.g. aerial crop spraying) to the surrounding agricultural lands due to turbine placement in relation to the St. Josef project and St. Leon project, MB.

Concerns related to impacts to other tenure holders and land users were also raised in British Columbia – just not as frequently in comparison to all other issues raised in that jurisdiction. The Bear Mountain Grazing Association commented on the Bear Mountain Wind Park project and potential conflict between the project and grazing tenure holders. They were concerned with the project further extending into their grazing reserve, loss of grazing and tame pasture, project access road into the grazing reserve, disruption of seasonal grazing use, interruption on cattle travel corridors and grazing pattern. In Cape Scott Wind Farm, BC, one mining company (Kamaka Resources Company) raised concern about issuing a ‘license of occupation’ for the wind energy project within the area of the company's mineral claims, as establishment of the towers and infrastructure would force the company to give up the exploration and development of their property.

Table 4.5: Most frequently raised issues (top 50% based on frequency) by jurisdiction in comments and submissions to the EA process for the sample of 16 wind energy projects

Jurisdiction	Issues	Frequency	Projects
BC (6 projects)	Impact on terrestrial environment	99	6
	Setback distances	46	3
	Noise	42	3
	Impact to aquatic environment	39	6
	Flickering/strobe light effects/shadow/light pollution	37	1
	Impact on recreation	31	5
AB (6 projects)	Noise	23	6
	Impact on terrestrial environment	24	6
	Impact on other tenure holder/license/land usage	17	4
	Impact of project (other than noise and light) on health	17	4
	Visual impact	11	5
	Loss of property value	10	3
SK (2 projects)	Impact on terrestrial environment	15	2
MB (2 projects)	Noise	11	1
	Impact on other tenure holder/license/land usage	8	2
	Potential technology related hazard	7	1
	Visual impact	6	2

4.4 Issues raised by project in each jurisdiction

4.4.1 British Columbia

Figure 4.2 shows the most frequently raised issues for the BC projects. Those issues frequently raised for the Bear Mountain Project were raised almost twice as frequent versus other projects. This project had the highest number of issues raised based on frequency and greatest diversity of issues. The possible cause of gaining more attention for this project might be that it was BC's first fully-operational wind park and is located just outside (16 km southwest) of the city of Dawson Creek. The next most frequently and greatest diversity of issues were raised for the Meikle Wind Energy Project, which was the most recent wind project in BC. The most concerned group with this project was Indigenous group; the project is located on Provincial Crown Lands and within the traditional territory of Treaty 8 First Nations. For the Cape Scott project, one possible reason for fewer issues raised compared to Bear Mountain and Meikle might be its lower power generating capacity; most of the issues raised frequently were about local, project specific impacts and were raised by government. The fewest issues were identified for the Dokie Wind Project, which is located on Provincial Crown and far away from the nearest community. Though the Thunder Mountain Wind Project had the highest power generating capacity, issues were less frequently raised this project – it's a longer distance from a community, with the closest community being Tumbler Ridge. Overall, the number and diversity of issues raised varied from project to project.

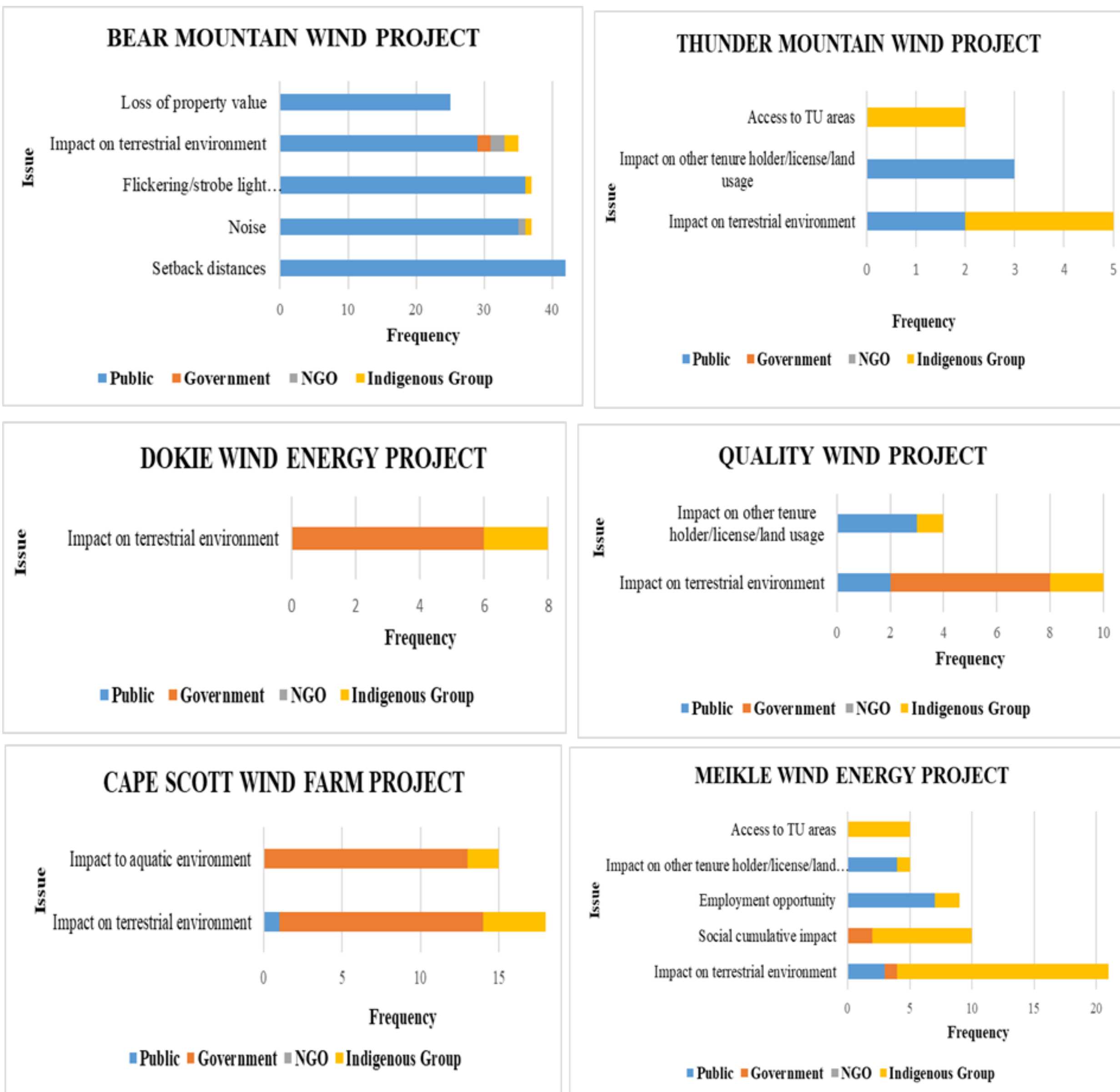

Figure 4.1: Most frequently raised issues by concerned group by project, BC

4.4.2 Alberta

The most frequently raised issues (top 50% based on frequency) in EA comments and submissions for projects in AB are presented in **Figure 4.3**. The Oldman 2 Wind Farm and Ghost Pine Wind Farm recorded a higher frequency of issues and concerns, and the Hulkirk Wind Project recorded the lowest. Both Oldman 2 and Ghost Pine Wind Farm are located relatively closer to communities than the Hulkirk Wind Project. Blackspring was the largest wind farm in Alberta, but the frequency of issues raised was low; this project is located on privately owned land and about 30 km away from the nearest city (Lethbridge). Issues related to noise and impact on terrestrial environment were raised in almost every project in AB. Public comments and submissions were most prevalent, followed by Government – which is unlike BC. Indigenous group and NGO comments and submissions were less. Also, unlike BC, the number and diversity of issues for projects varied from 10 to 14 different issues, except for the Hulkirk Wind Project.

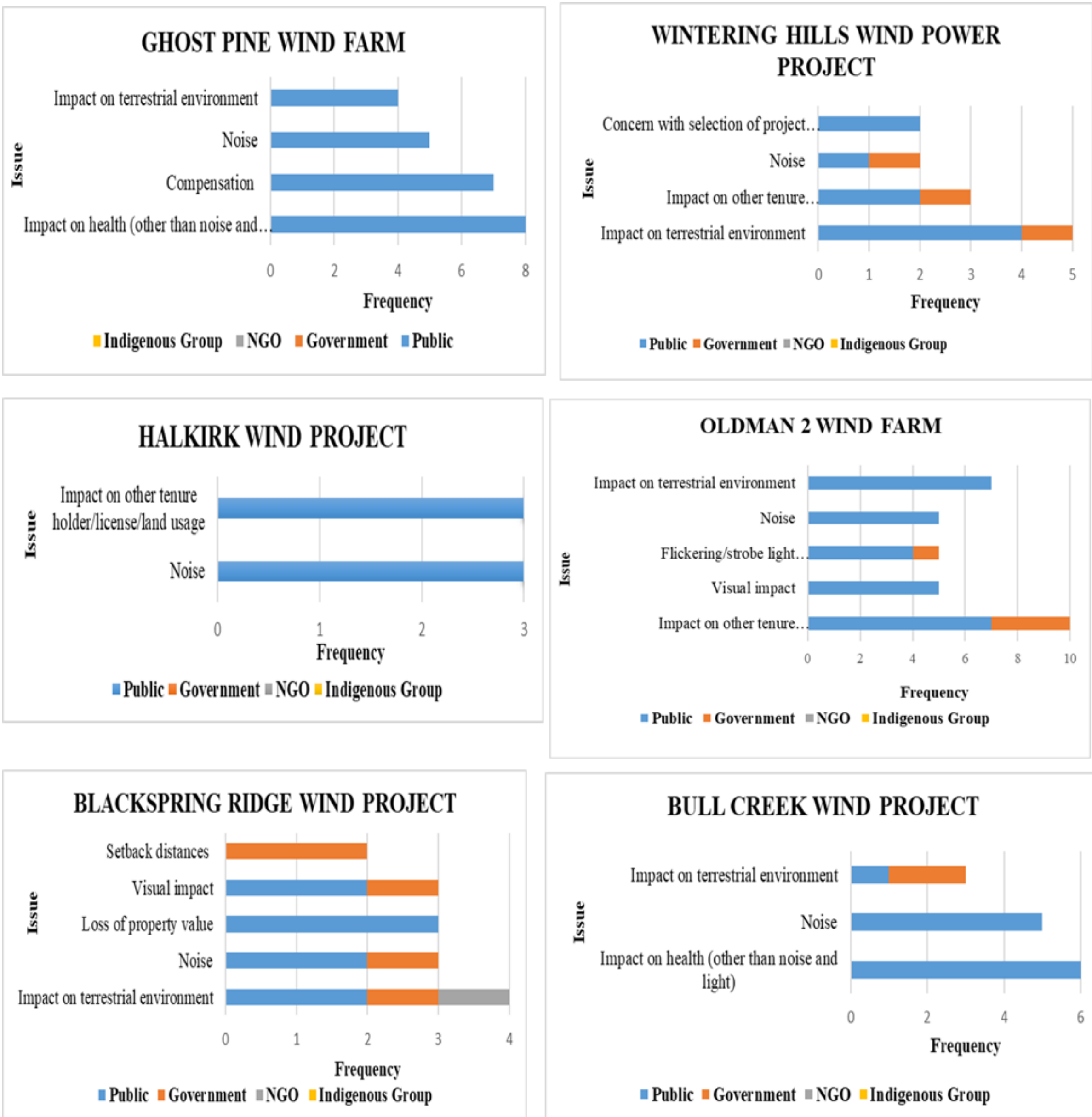

Figure 4.2: Most frequently raised issues by concerned group by project, AB

4.4.3 Saskatchewan

Figure 4.4 presents the most frequently raised issues for SK projects. NGOs proportionately raised more issues for projects in SK than for projects in either BC or AB. The overall frequency of issues raised for the most recent wind project in SK, Blue Hill, was higher than the Chaplin Project. Blue Hill is also located closer to a community than the Chaplin Project. However, the EA application for the Chaplin Wind Project was refused due to key concerns about the project's siting and impacts to terrestrial environment – especially its proximity to designated important bird areas and along a known migratory corridor. Saskatchewan projects has less diversified issues (5-7) than projects in either BC or AB.

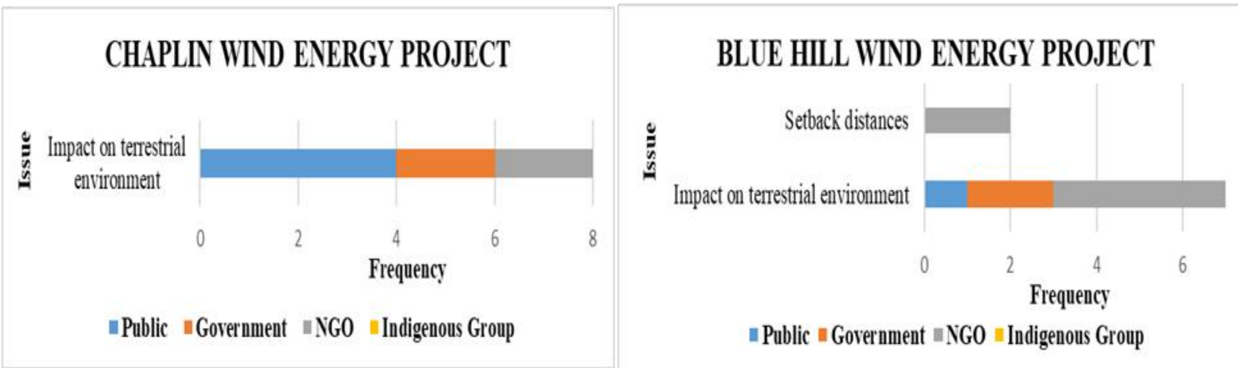

Figure 4.3: Most frequently raised issues by concerned group by project, SK

4.4.4 Manitoba

The most frequently raised issues for projects in MB are shown in **Figure 4.5**. Frequently raised issues for the St. Josef project were double of those raised for the St. Leon project; issues related to impacts on other tenure holders or on aerial applications were raised for both of these projects. Both projects are located in vicinity of communities and on privately owned agricultural land, with St. Josef the most recent wind project in MB. Most concerns raised for these projects were raised by the public, similar to AB. Overall, a comparatively lower diversity of issues were raised for projects in MB than BC.

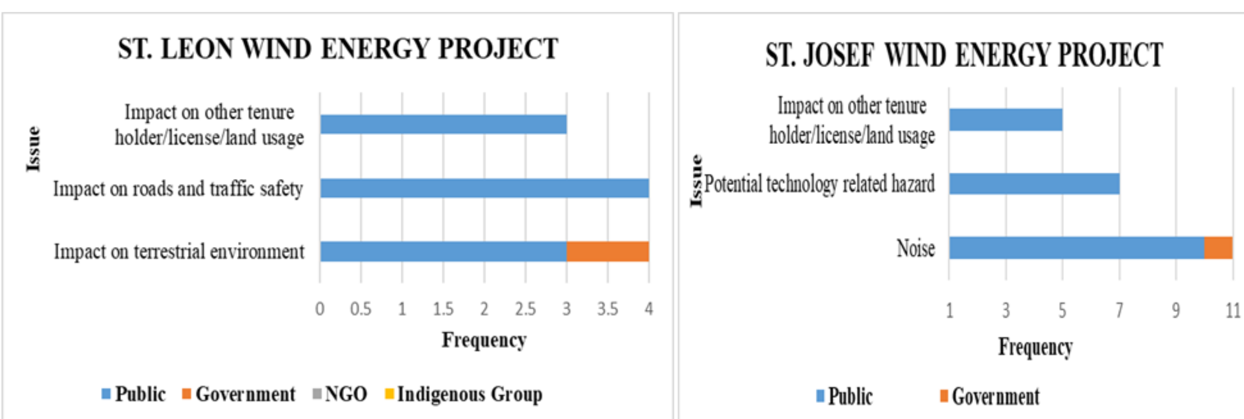

Figure 4.4: Most frequently raised issues by concerned group by project, MB

4.5 Emergent themes

The 50 issues identified, raised 848 times in public and other stakeholder submissions and comments, capture the things that people are generally concerned about when wind energy projects are proposed in western Canada – based on the sample of projects reviewed. These issues could be categorized into 11 broad themes (**Table 4.6**), with the four most dominant themes related to: *land use* followed by issues related to *population and human health*, *impacts on natural ecosystems*, and *economic opportunity*. These four themes captured 79% of all issues identified based on the frequency they were raised in submissions and comments. The remaining 7 themes are still important, but less dominant based on the frequency with which they were raised.

Table 4.6: Broad themes of issues and frequency they were raised across the sample of projects

Broad theme of Issues	Frequency
Land use	200
Population and human health	190
Impact on natural ecosystems	185
Economic opportunity and impact	98
Concern with EA process	44
Social value and culture	36
Cumulative impact	31
Possible hazard and risk (project activities and infrastructure)	27
Concern with renewable energy development	23
Climate change	8
Other	6

The issues raised by public, government agencies, NGOs and Indigenous peoples that comprise these 11 broad themes are issues that proponents and practitioners need to (or are at least expected to) deal with. These broad themes, and the issues they capture, are mapped below (**Figure 4.6**). However, not every issue that maps to these broad themes is likely a project-based or a *project-specific* issue. Some of these issues are more regional or strategic in nature, for example: within the land use category, most issues concern impacts on other tenure holders or land uses, including industrial land tenures use and land use by other utilities, licensees or infrastructure. In contrast, many issues that map to population and human health seem to be largely project specific issues that people raised about project-specific impact on population and human health caused by the project.

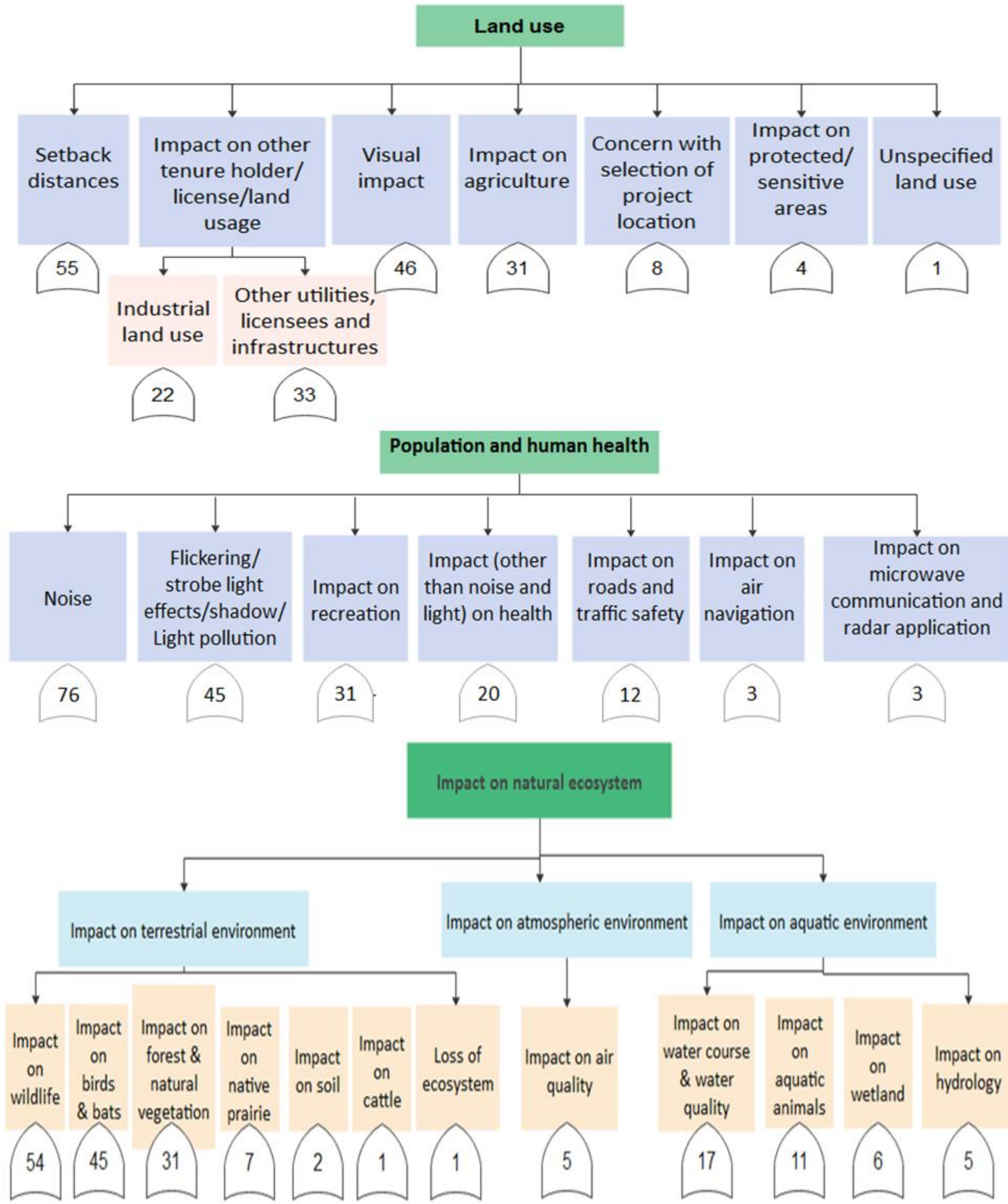

Figure 4.6.1: Map of Issues and specific concerns categorized by broad theme*[1]*

[1] Green box represents category of broad theme, blue box represents issues under each broad theme, and red box represents specific concerns related to each issues. All the curved triangle shapes contain the frequency of issues and specific concerns.

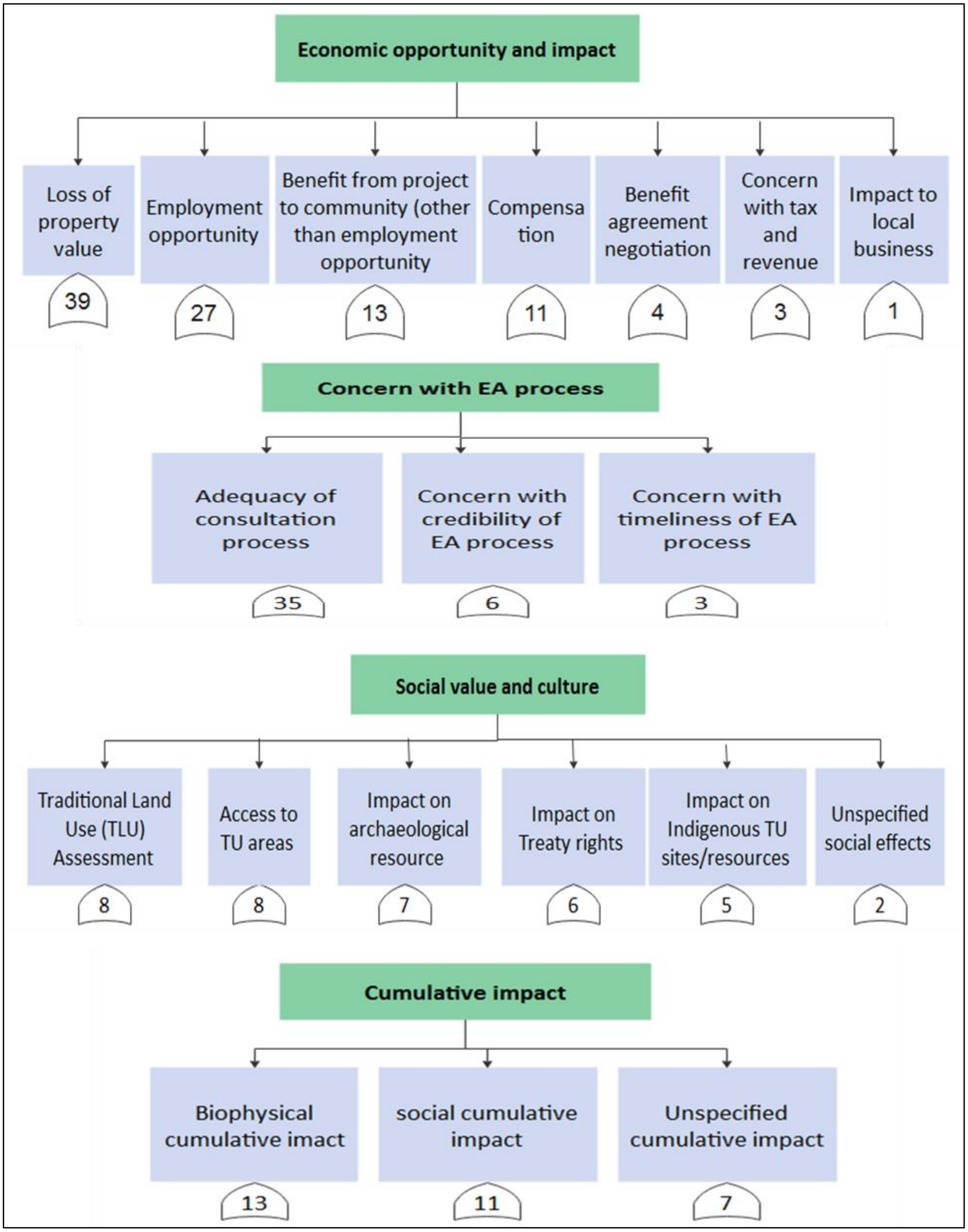

Figure 4.6.2: Map of Issues and specific concerns categorized by broad theme

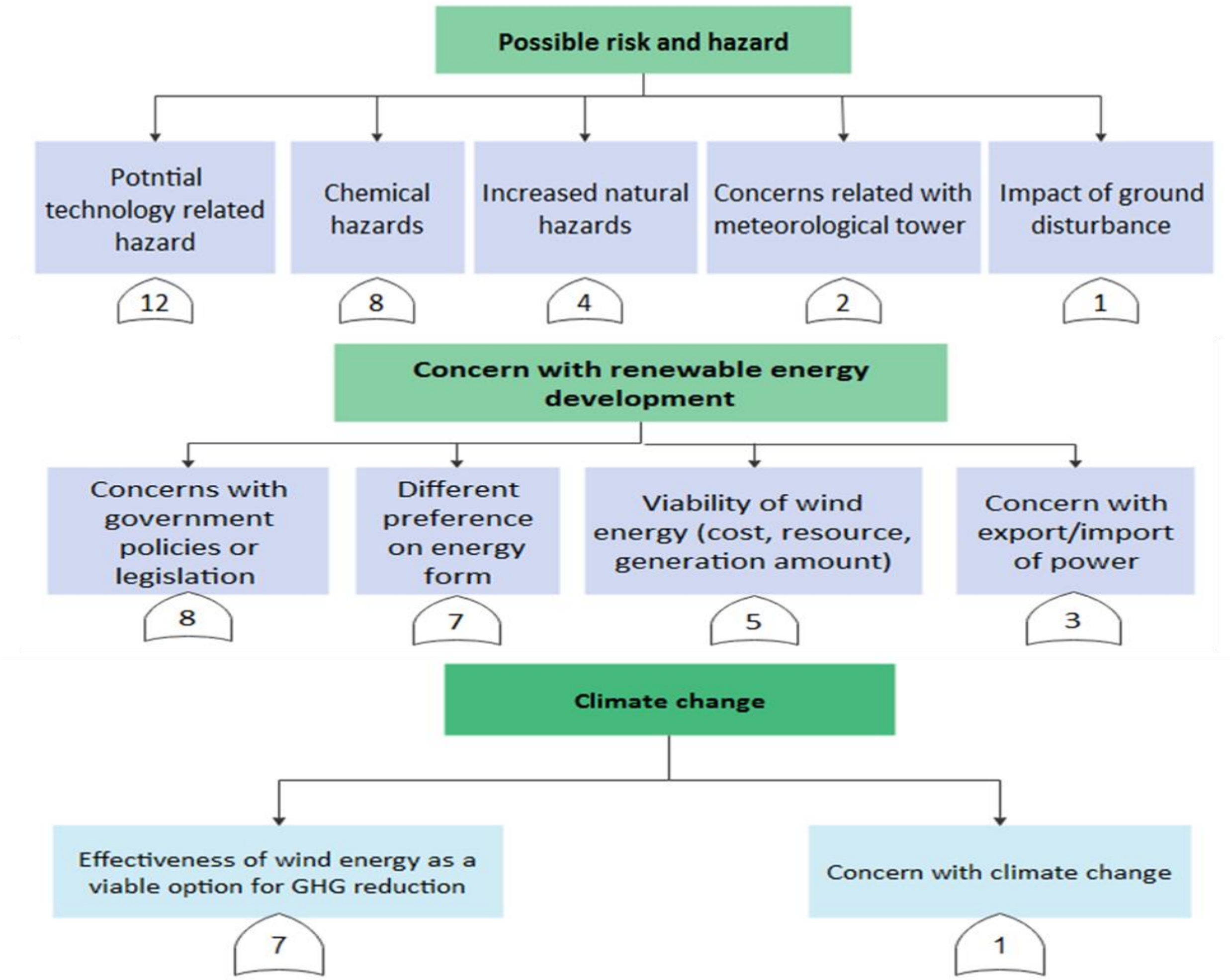

Figure 4.6.3: Map of Issues and specific concerns categorized by broad theme

4.5.1 Land Use

The most frequently identified issues map to broad theme of land use. Within this category, many of the issues may be beyond a project proponent's and EA's capacity – such as competing and conflicting land use, where projects are situated relative to sensitive areas, and site selection which are frequently raised issues that project proponent cannot always deal with effectively during at the EA stage. In principle, these broader land use and planning issues would normally be, or at least should be, dealt with before a project is proposed (Cowell, 2010; Geißler et al., 2013; Jay, 2010b; Nadai, 2007; Ohl & Eichhorn, 2010; Phylip-Jones & Fischer, 2015). Issues related to setback distances, impact on direct impacts to agriculture, and visual impact also map to this broad theme of land use which, may be considered more specific project impacts on the local project environment.

4.5.2 Population and human health & impacts on natural ecosystems

Within population and human health, most of the issues are related to noise produced by project construction and operation, flickering/light effects, and recreation, which are normally mitigated at the project level. Potential impact on health and impact on road and traffic safety issues are also mitigated by taking measures or precautions within a specific project impact management system. Similarly, all of the issues mapped to impacts on natural ecosystem are local, specific, and directly related to the local project environment. Most of the issues regarding impacts on natural ecosystems are the typical types of issues and impacts associated wind project development, namely impact on specific local terrestrial environments and species and impact on specific local aquatic environments and species.

4.5.3 Economic opportunity and impact

The most frequently raised issues mapped to the economic opportunity and impact theme were related to decreasing property values and employment opportunity, which are or could be efficiently addressed at the time of project planning. This category also includes issues related to other project benefits, benefit agreement negotiation and compensation, which arguably are dealt with external to the project EA process – such as through privately negotiated impact and benefit agreements (Fidler & Hitch, 2007).

4.5.4 Concern with EA process

Issues mapped to the broad category of concern with EA process were related to concern with consultation process, credibility to the EA process (e.g. fairness of the decision making process, biasness in the assessment) and timeline of project review. These issues reflect public perception to the process under which any specific project is reviewed. A fair planning process ensuring early participation of stakeholders can address most of these issues (Firestone et al., 2012).

4.5.5 Social value and culture

Issues related to impact on and access to Indigenous TU areas or resources (e.g. effects on valued components of Indigenous traditional/cultural activities, impact on traditional use plants, impact on treaty rights, impact on access to traditional hunting areas) and TLU assessment (e.g. request for conducting a TLU assessment) are two major issues mapped to the category of social value and culture. These issues might create controversy between proponents and affected Indigenous peoples. Actions required to address these issues cause additional delay and cost for proponents at the time of project EA. These issues related to traditional value and culture could be better addressed outside of project EA, for example, through conducting separate TLU assessment prior to project planning and proposal.

4.5.6 Cumulative impacts

The broad category of cumulative impacts includes concerns related to incremental impacts on biophysical environments (e.g. Cumulative effects of noise from all facilities of study area, cumulative effects on wildlife), socio-cultural structure (traditional uses and practice, policing resources, social determinants of health), and other types of cumulative impacts (e.g. regional cumulative impacts, cumulative impacts of other wind projects of the study area). These are hard to effectively mitigate by proponents of any specific project due to the inherent challenges in assessing and managing of cumulative effects. Individual project proponents rarely have the capacity and access to all necessary information to identify and evaluate potential relevant past, present and future activities and their effects. Although issues of this category were raised at a lower frequency, these often create uncertainty and delay in project review (Willsteed et al., 2018). Issues related to cumulative impacts should normally assessed in regional planning and assessment outside of project EA (Chetkiewicz & Linther, 2014; Joseph et al., 2017).

4.5.7 Possible risk and hazard

Issues concerning potential technology related hazards, chemical hazards and natural hazards resulting from project infrastructures and construction and operation activities were mapped to the broad theme of possible risk and hazard. These include risk from wind turbines (e.g. ice throw, fire, safety-speed limit), risk from chemical substances (e.g. acid rock drainage, metal leaching), and waste material disposal. These are specific project issues normally mitigated through carefully project design and impact management action within specific project.

4.5.8 Other broad themes

Issues mapped to the broad themes of 'concerns with renewable energy development' and 'climate change' were raised less frequently. Issues under the broad theme of concerns with renewable energy development were not focused on project specific issues. Rather, these were focused on the larger regulatory system and policies or legislation related to energy development (e.g. government incentives/subsidy, project contribution to the import of power) and technology viability. Issues related to GHG reduction by wind energy, climate change impact, (e.g. effectiveness of wind energy project for GHGs reduction, GHG emission from project activities) and impact on air quality (e.g. dust) were mapped to the broad theme of climate change. Addressing most of these issues at the project level is not likely to be possible for proponent due to limited scope of assessing contribution of any individual renewable energy development in global or regional GHG reduction. These broader issues are better suited to be planned, regulated or dealt with by government or regional planning authorities at the strategic level of provincial policy or land use planning.

Chapter 5
DISCUSSION

Results present the frequently raised issues and concerns (see Table 4.1 and Table 4.3) across all submissions and comments to the EA process from a sample of 16 wind energy projects from BC, AB, SK and MB. A total of 50 different issues were raised 848 times by government reviewers, project interveners, and other affected interests when projects had been proposed for development and these were related to 11 broad themes (see Table 4.6). Most of the issues (78%) could be mapped to four broad themes: land use (issues raised 200 times), population and human health (raised 190 times), impact on natural ecosystem (raised 180 times) and economic opportunity and impact (raised 98 times). Although the dominant theme was land use, the most frequently raised issues were related to project specific impact on the local environment (natural ecosystem) and human wellbeing (population and human health). Issues that mapped to the broad themes of overall concerns about renewable energy development and climate change were raised less frequently than others.

Projects from British Columbia and Alberta experienced higher frequency and diversity of raised issues than the projects examined from Saskatchewan and Manitoba. Of the different stakeholders, the general public raised the most issues in terms of frequency and the greatest diversity of issues. Variability was also observed between and across projects and provinces in terms the number and diversity of issues. For example, issues related to impacts on terrestrial environments were raised for most of the projects across all four jurisdictions, but issues related to impacts on recreation were raised only for projects in British Columbia; and larger concerns about the role of renewables in the province's energy strategy were raised only for the Bear Mountain project, also in British Columbia. Government and NGO mostly raised project specific issues focused on impacts to natural ecosystems and population and human health, whereas concerns raised by other interests were generally more diverse. Overall, several key observations emerged from the research, each of which is addressed below, and the implications discussed for the role of EA in renewable energy transition.

5.1 Diversity of issues raised and project characteristics

Although the sample of projects reviewed spanned 14 years (from 2005 to 2018), there was no apparent relationship between the number or diversity of issues raised and whether it was a more recent or older project. For example, the Bear Mountain project was the first wind project in British Columbia and had the highest frequency of issues raised during the EA review process; but in Saskatchewan, the older Chaplin wind energy project had fewer raised issues than the most recent wind energy project in the province. Further, no clear pattern was observed between the number or diversity of issues raised and the size of the project. For example, Blackspring is the largest wind project in Alberta, in terms of power generation capacity but experienced a lower number and diversity of issues raised by different concerned groups - 14 different issues were raised 27 times. In contrast, issues raised for the Oldman 2 project, one of the smaller projects in Alberta, were higher in both number and diversity than the Blackspring - 18 different issues, raised 53 times.

However, results do suggest that more issues are raised by public and other interests when projects are located closer to settlements. For example, Bear Mountain had the highest number and diversity of issues raised and is situated only 16 km southwest of Dawson Creek, within the encompassed treaty lands and in an area extensively used for community purposes, recreational use, pasture tenures, forestry tenures and other private tenures. The Oldman 2 Wind Farm of Alberta also had a high number of raised issues - it is located on privately owned land only 10 kilometers northeast of Pincher Creek, which is used mostly for agriculture. In some respects, this is not surprising given the various literature on project siting (e.g. Firestone & Kempton, 2007; Khan, 2004a; Rabe, 1994; Swofford & Slattery, 2010; Thayer & Freeman, 1987; Van Der Horst, 2007) and NIMBY (not-in-my-backyard) perspectives (e.g. Bell et al., 2005; Burningham et al., 2015; Burningham, 2000; Devine-Wright, 2009; Freudenberg & Pastor, 1992; Krohn & Damborg, 1999; Spowers, 2000). For example, Swofford & Slattery (2010) found in a survey of perceptions of wind energy in the state of Texas, USA, that those living closest to a wind energy project are less likely to accept a wind farm in their neighbourhood than others living at greater distances. Another study in the USA by Thayer & Freeman (1987) found similar results in that people living closer to wind farms had more negative concerns. Van der Horst (2007) predicted that some level of ‘distance decay’ likely exists regarding public concern with wind farms whereby concerns may decrease with distance. Baxter et al. (2013) reported from a case-control survey with wind turbines that lower levels of support exists in rural communities without turbines, and particularly among those who live close to turbines and even supporters of them have concerns.

Although many authors (e.g. Devine-Wright, 2013; Krohn & Damborg, 1999; Petrova, 2016; Wolsink, 1994; Wolsink, 2000) criticize NIMBY theory, they often agree that siting of wind power and other renewable energy projects are frequently met with controversy and opposition at the local level from neighbouring residents and other local actors. This study neither supports NIMBY theory nor makes any relationship between proximity and public attitude, but emphasizes that proponents could expect higher number and diversity of issues raised during the proposal and review of renewable energy projects, such as wind turbines, located in close proximity to communities. It agrees to the literature that critique NIMBY concept as an inadequate and inappropriate way of thinking and describing local opposition and resistance to any development (Burningham, 2000; Devine-Wright, 2013; Mcclymont & O'Hare, 2008; Swofford & Slattery, 2010; Wolsink, 2006)

However, results of this research and previous studies also speak to the general support for wind energy, which is greatly influenced by issues and concerns raised during the project review stage at the local level. Studies on preferences about renewable energy have found considerable general public support for wind and other renewable energy in Canada and other countries (Ek, 2005; Graham et al., 2009; Krohn & Damborg, 1999). Jones & Eiser (2010), for example, found in England that local people tend to be in favour of wind power development as long as development was anticipated to be ‘out of sight’, arguing that anticipated visibility of development along with other concerns of potential impact on communities influences public attitude towards wind power development. Similarly, many studies have shown that though people are not against wind farms in general, public attitude and perception depend greatly on different factors as expressed by those issues and concerns raised at the local level when such projects are proposed (Burningham, 2000; Devine-Wright, 2005; Firestone & Kempton, 2007; Graham et al., 2009; Walker et al., 2014). Low support for wind energy projects can result from inadequately addressing the issues and concerns raised prior to, and during, the project siting and impact assessment process (Jami & Walsh, 2014). Results of this study, coupled with findings from previous research, thus suggest that local opposition to renewable energy projects can stem from reasonable and well-grounded issues and concerns of residents and other actors when they go unaddressed during the project planning and review stages (Freudenberg & Pastor, 1992; Khan, 2004a). Contradicting NIMBY concept this study also suggests that local attitude and opposition to renewable energy projects could be better explained considering how these issues and concerns of local communities are addressed during project planning and review process rather than NIMBYism (Devine-Wright, 2005a; Krohn and Damborg, 1999; Swofford & Slattery, 2010; Warren et al., 2005; Wolsink, 2000)

These results have implications for both project proponents and decision makers, in that early consultation and engagement practices for wind energy projects may need to be enhanced. Proponents and decision makers cannot assume that wind energy development, unlike fossil-fuel projects, will not cause concern about environmental and socio-economic impacts simply because it is renewable energy. Support for wind energy technology in general does not mean that public and other stakeholders will not raise concerns about the impacts of those projects, especially when they are close to their communities (Mclaren Loring, 2007). Toke et al. (2008) argue that proponents often take public support for granted for the placement of turbine on a landscape, which leads to public opposition and potential conflict. Therefore, and considering the extant of issues identified from the sample of wind energy projects reviewed in this research from western Canada, better engagement and consultation processes are necessary for wind energy project EA reviews. Proponents and decision makers should think about improved consultation earlier, engaging local people in early pre-project planning to pre-empt concerns rising during the EA process. This may not only provide developers with an opportunity to effectively identify and address stakeholder's issues and concerns (Corscadden et al. 2012; Jami & Walsh, 2014), but also help to reduce EA review timelines (McMaster et al., 2020).

Many researches have identified early engagement in the planning process as a way to address locally raised issues and concerns (Devine-Wright, 2005; Graham et al., 2009; Jones & Eiser, 2010; Khan, 2003; Krohn & Damborg, 1999). Rowe & Frewer (2000) argue that the public should be engaged in the planning process of the project "as soon as value judgements become salient", meaning that many of the issues identified in the projects reviewed in this research should be considered before starting the costly process of specific project planning and applying for permissions (Khan 2004b). McLaren Loring (2007), for example, through 18 in-depth case studies of wind power projects in England, Wales, and Denmark shows that high participation in planning results in high project success. Although all provincial EA processes considered in the scope of this research allow for some degree of public engagement (McMaster et al., 2020), experience from Ontario, for example, indicates that engagement in wind power projects too often turns into one-way information flow (Fast et al. 2016). Given the controversial history of EA for energy projects in Canada in general, improved guidelines for local engagement in EA are necessary to support renewable energy transition.

5.2 Identifying and addressing recurring project issues

Results indicate that there are many recurring issues and concerns that are raised by the public and other interests when wind energy projects are proposed, and that these issues are both project and strategic in nature. Many of the typical issues relate to visual impact, competing and conflicting land use, proximity of wind turbines, site selection, impacts on terrestrial and aquatic environment, noise produced by project construction and operation, flickering/light effects, impacts on recreation, decreasing property values, concerns about consultation or communication processes, and impact on and access to TU areas or resources (see Table 4.1). Many previous studies have also identified these as significant issues to local communities regarding renewable energy development (e.g. Baxter et al., 2013; Langbroek & Vanclay, 2012; Larsen et al., 2015; Mulvihill et al., 2013; Thygesen & Agarwal, 2014; Toke et al., 2008; Wolsink, 2007). For example, Devine-Wright (2005) report that visual impact and noise are frequently raised concerns. Ellis and Ferraro (2016) indicate that for people living near wind energy projects the main issues and concerns typically include impacts on landscape, bio-diversity, health, noise and property values. Aitken (2010) and Firestone et al. (2012, 2018) found that concerns with current practice, such as fairness of decision making process and limited time frame for application review, are also typically raised by public and important to shaping public attitudes.

These are issues that have been shown to be typical during wind energy development, and thus should not come as a surprise to proponents or governments planning wind energy projects. Many of the issues identified during the review of project EAs in western Canada are thus *common issues* and, arguably, relate to what proponents and regulators generally should be prepared to address during, or in advance of, any wind energy development application and project EA review process. Issues such as project-specific impacts on biodiversity, soil, water, air, climate, landscape and other biological and ecological components of environment including population and human wellbeing (Geiβler et al., 2013; Honrado et al., 2013; Larsen et al., 2015; Larsen et al., 2018) appear to be typical project-related issues raised frequently during wind energy development regardless on project size or location or jurisdiction, and fall within the scope of what a project EA can be expected to address. Many such issues are likely to be local and may not need a strategic perspective to be addressed effectively (Jay, 2010a).

Proponents should anticipate such concerns and regulators be prepared to handle them through standard mitigation measures. For example, environmental and ecological concerns, such as impact of wind turbines on wildlife, most notably mortality rate of birds and bats, can be addressed adequately within project design (American Wind Wildlife Institute, 2017; Jami & Walsh, 2017; Zimmerling et al., 2013). Fast et al. (2016) and Knopper et al. (2014) report that primary health concerns about wind turbines could be mitigated socially and within project specific review processes, along with concerns about noise, transport and other impacts on local communities (Kørnøv et al., 2005).

Most of the issues (see Table 4.1 and Table 4.2) identified in the sample of EAs reviewed appear to be typical issues, previously addressed in the literature and other case studies, project-based, and should likely be expected by proponents and regulators– meaning that routine mitigation measures are likely possible to improve EA efficiency and effectiveness for wind energy projects, or at least to proactively address these concerns in advance of EA review. In doing so, it might be possible to pre-empt these concerns through early engagement or improved mitigation practices and thus reduce potential delay in EA because of such issues emerging at the time application. Although most of these issues are not new or unique, they keep coming up repeatedly at the project EA level (Doelle & Critchley 2015). One of the possible reasons might be that EA are conducted on a project-by-project basis and there is limited scope of knowledge sharing across these projects (Noble et al. 2017, Sheate & Partidario 2010, Write, 2014). Sheate & Partidario (2010) explained that typical views or perspectives on certain situation are often expressed because of knowledge gap due to lack of knowledge exchange and transfer. Argyris and Schön (1978) described in their work on transformative learning how learning could change attitudes, perceptions and routines of individuals and organizations (Fischer et al., 2009). Although recent researches on effectiveness of EA consider Knowledge and learning as an effectiveness criteria along with others, current practices of project based EA are being challenged by knowledge gaps and insufficient learning from experiences (Bond et al., 2013; Diduck & Mitchell, 2003; Sánchez & Mitchell, 2017; Write, 2014). As EAs are conducted on a project-by-project basis, issues and concerns are raised for each project separately, and therefore management strategies are also designed individually rather than following a coordinating framework (Hackett et al., 2018). Thus, knowledge learned and information from a single project is not shared and transferred to improve future projects, to improve future projects, realize process efficiencies, or proactively address typical issues (Noble et al. 2017; Sheate & Partidario 2010). Due to this knowledge gap, future projects lose a potential opportunity to avoid higher number of common issues raising again and again, and face uncertainty about impacts and issues (The Crown Estate, 2014; Write, 2014).

5.2.1 Improved knowledge sharing from project to project

Pre-empting such (above mentioned project specific) issues and concerns requires that proponents and decision makers are aware that such issues and concerns exist. It also means that potentially affected communities are provided with the information in advance of wind energy proposals so that they understand what to expect. Sharing a common understanding of those issues among all key stakeholders and establishing a clear and common set of values and priorities is necessary to support wind development (Doelle & Critchley, 2015).

Improved sharing of knowledge across project experiences about typical issues and concerns is necessary to provide wind energy developers and decision makers with insights to guide their planning and policy development and consultative engagement (Hall et al., 2013). Evidence based knowledge sharing from past experiences can provide meaningful information and address raised issues and provide focus to EA reviews. Wright (2014), for example, report for marine renewable energy projects that shortage of relevant and reliable knowledge results in an additional burden on developers and it will be beneficial to the whole industry if privately collected data could be made available to the public. Khan (2004c) believes that development of wind power projects tends to be less complex and less unique at the local level than other renewable energy projects, such as bio-gas for example, and most of the associated issues and challenges are unlikely to vary among projects.

Although knowledge sharing across projects is necessary to ensure that EA facilitates renewable energy development, research indicates that in practice there is limited sharing and application of lessons from one EA to the next (Hackett et al., 2018; Mulvihill & Baker, 2001). Even during data collection for this study, it was found that accessing public EA documentation was difficult and for some projects and jurisdictions it is not even available. Horvath & Barnes (2004), both EA practitioners, believe that access to previous EA documentation can improve efficiency and the quality of project-specific EA. A dedicated online knowledge-sharing platform about wind energy issues, impacts, data, and mitigation strategies is necessary for archiving EA information and obtaining relevant EA guidance and assistance to support best practices. Currently, provincial EA registries are incomplete and information about wind energy projects and public issues and concerns not easily accessible. A knowledge broker may be required to support such initiatives; perhaps, as suggested by McMaster et al. (2020), established under the Canadian Council of Ministers of the Environment or by way of the Canadian Wind Energy Association – a non-profit wind energy association that represents energy owners, operators, manufacturers, project developers, consultants, and service providers, and other organizations (see https://canwea.ca/).

5.3 Identifying and addressing recurring strategic issues

Many other issues identified from the sample of wind energy EAs reviewed appeared to be more strategic in nature and, perhaps in some cases, beyond the scope and scale of what the project assessment could resolve (see Table 4.1). These are mostly related to land use, economics, and social values and cumulative impacts (see Table 4.6 and Figure 4.6). For example, concerns about conflicting land uses were raised for Hulkirk project, Alberta. Specifically, Prairie Mines and Royalty Ltd, a thermal coal producer, raised concern that their coal rights may be impacted by the project, rendering coal reserves unrecoverable because of surface access restrictions near the wind facility. Concerns with site selection were also raised during the Bear Mountain project EA, British Columbia. Several community interveners were opposed to the proposed wind farm location and suggested instead that the proponent consider alternative locations and reuse abandoned mines and industrial sites. Concerns were also raised about the Chaplin project, Saskatchewan, and its location near an internationally recognized bird sanctuary. The project was rejected by the provincial government – an outcome that perhaps could have been avoided through better strategic land use planning and zoning.

Many studies report that landscape and land use are the most dominant among reported concerns with wind energy projects (Doelle & Critchley, 2015; Fast et al., 2016; Jobert et al., 2007;

Langbroek & Vanclay, 2012; Wolsink, 2007)– sometimes even more so than for fossil or nuclear energy developments (Wüstenhagen et al., 2007). Tabassum-Abbasi et al. (2014) explain how locating wind farms can be difficult without causing conflict with existing land uses, and land-use issues pose the most significant barriers to wind energy development at the local level in many countries (Mclaren Loring, 2007). People are often concerned about impacts to property value (Firestone & Kempton, 2007; Graham et al., 2009; Jami & Walsh, 2017; Larsen et al., 2018; Mulvihill et al., 2013), such as in the case of the Blackspring project, Alberta. In other cases, concerns about impact to traditional use resources and culture (land and livelihood) are key concerns (Doelle & Critchley, 2015). In the case of Meikle project, for example, Halfway River First Nation believed that the project would result in residual effects to the valued components of "First Nations Traditional/Cultural Activities and Cultural Use Sites" and "Communities and Services". They were also concerned that Treaty Rights would be affected by the imposition of limits to access to land.

Similarly, in Norway and northern Sweden, concerns about wind energy developments are often about the cumulative impacts on the landscape and conflict with traditional use patterns. For example, the Markbygden wind farm in Northern Sweden has generated serious concerns from Sámi (indigenous Finno-Ugric people inhabiting the Arctic area of Sápmi) reindeer herding communities that the project will encompass Sámi reindeer grazing areas and restrict the movement of reindeer herders (Szpak, 2019; Large-scale Wind Farm in Sami reindeer land Sweden, 2020). Similar disputes over wind energy development have been raised in Norway; for example, conflict is occurring between Norwegian authorities, project developers and the reindeer herding community for the Oyfjellet wind project due to the potential impact of the project on Sámi reindeer herding culture (Fjellheim & Carl, 01 Aug 2020). The Southern Sámi of Norway claim that industrial-scale wind turbines will have negative effect on reindeers' pasturelands and disrupt Saami herding practices, livelihoods, and consequently their cultural survival (Lee, 2019 October 17; Norman, 2020).

There were also strategic issues identified in public comments and submissions from the same of EAs that were *not typical* across the sample of projects reviewed, but nonetheless issues of concern that stakeholders are bringing to the table during the EA process. The most interesting was the role of renewables in climate change mitigation. Gerrard (2008) and Smart et al. (2014) report that questions are often raised about climate change mitigation when renewable energy developments are proposed. Smart et al. (2014) explain that questions often relate to the ability of wind power to sufficiently contribute in GHG emissions reduction and to global climate change mitigation. Citizens often hold different perspectives on renewable energy alternatives and the allocation of land and resources for renewables (Noblet et al., 2015), and sometimes raise questions about the validity and overall viability of small-scale renewable development projects (Scott et al., 2014).

The types of strategic issues noted above are important to address in the transition to renewable energy, especially when transition requires new infrastructure, but they may be beyond the ability of proponents to effectively resolve within the scope of their EA, or at least difficult to resolve at the time an EA is submitted. This is especially the case for wind energy projects – which rarely undergo large-scale, comprehensive assessments or panel reviews (McMaster et al. 2020). For example, the consideration of alternatives in project-level EA is usually restricted to technical project design (Steinemann, 2001), and the consideration of alternative locations for wind farms within EA remains especially limited (Phylip-Jones & Fischer, 2013; Smart et al., 2014). For example, public submissions requested to move the Bear Mountain wind project away from where people live and recreate, and suggested to reuse nearby abandoned mines and industrial sites that already have access roads and power lines. In the case of Wintering Hills project, the public were opposed to building the project near or on agricultural land in a populated area and asked that it be built on nearby marginal grassland in a sparsely populated area. Similar challenges are reported in Ontario, where Mulhivill et al. (2013) state that project level planning of site selection for wind energy is not effective.

Impacts of wind turbines on such strategic issues as cumulative impacts to landscapes and cultural values are inadequately scoped at the project level by proponents; Larsen et al. (2018), for example, found a number of social issues, such as aesthetic impact, property value and cumulative impacts, raised about wind energy developments in Denmark are not well addressed in the EAs. Strauss (2012) argues that a standardized procedure of EA has evolved with time for the siting of large scale energy projects, and it does not address adequately local culture and needs (e.g. rights to land and resources) of local Indigenous communities. Further, Gerrard (2008) and Smart et al. (2014) report that assessment of climate change mitigation is also poorly addressed at the project level, at the time of project reviews, as it provides limited scope to assess the non-local environmental benefit or impact from a specific development. Smart et al. (2014) go on to argue that the difficulties in understanding the cumulative benefits or impacts of emissions or emissions reductions from individual projects makes EA inherently unable to deal with climate change issues associated with wind power projects – both the life-cycle impacts and larger and longer-term benefits. Although most EA legislation directs proponents to consider broader cumulative effects, including effects to landscapes, climate and culture, they are often inadequately addressed or not addressed at all (Duinker & Greig 2006; Gunn & Noble 2011; Thygesen & Agarwal, 2014).

These types of issue have influence on energy transformation, but they are not unique to wind energy. For example, Mulvaney (2017) reports that utility scale solar energy development is causing land use conflicts with impacted local communities and Native American tribes in the American southwest. Concerns with cumulative impacts on traditional culture and resources, including Indigenous lands and treaty rights, caused by hydroelectricity, oil and gas, or pipeline projects generate conflicts that usually remain unsolved during project level EA (Booth & Skelton, 2011a; Chetkiewicz & Lintner, 2014; Noble, 2017; Udofia et al., 2017). Researchers have also noted that issues related to climate change impacts and emissions from the liquefied natural gas sector cannot not be resolved within single project EA (Luke & Noble, 2019; Noble, 2017). These widely recognized constraints of project based EA result in an understanding that many issues that emerge during project assessment relate to issues beyond site-specific project impacts and consideration of these issues must occur beyond project based evaluation to consider broader policy and regional planning contexts in which development projects operate (Fast et al., 2016; Fidler & Noble, 2012; Horvath & Barnes, 2004).

5.3.1 Toward a strategic solution

Recurring strategic issues in project EA may have significant implications for wind energy development, and thus advancing energy transition – both in western Canada and internationally. Macintosh et al. (2018) and Mclaren Loring (2007) report examples of new wind energy projects suffering from lengthy delays to reach an approval decision and a large number of planning applications for wind energy project being failed at the local level. McMaster et al. (2020) report EA review timelines for some wind energy projects in western Canada lasting from 160 to 419 days, but with one project in Saskatchewan in the EA process for 1,157 days and ultimately rejected. Addressing broader strategic issues within specific project EA, and the need to address typical or recurring issues each time a wind energy project is proposed, puts great pressure on EA timelines, resources, and the ability of proponents (Horvath & Barnes, 2004) and may even threaten the viability of some renewable energy projects (Enevoldsen & Sovacool, 2016; Geißler et al., 2013). Mulvihill et al. (2013) report that development of renewable energy projects at the local level is facing serious question without considering some historical, recurring, and emerging issues at the strategic level. They go on to suggest that the absence of an effective strategic level planning and assessment regime may results in net delay in the long run to fast-track and streamline the development of renewable energy projects. This is frustrating not only for developers but also for nationally and internationally important climate change objectives (Ellis et al., 2009).

Findings from this research suggest that a more strategic approach to wind energy development may be required to deal with strategic issues such as impacts on landscapes or sensitive areas before project applications are invited, and to identify *a priori* the issues and concerns typically raised during wind energy project reviews (e.g. Jay, 2010b; Thygesen & Agarwal, 2014). Different forms of strategic approaches including different regional or strategic level assessments and land use planning processes have been recognized as important to guide energy development, especially in the context of renewable energy transition around the world. Strategic level assessment delivers guidelines and recommendations to deal with bigger issues in the overall planning of resource management and offers opportunity to overcome significant shortcomings of project specific EA (Horvath & Barnes, 2004; Malvestio & Montaño, 2013). In western Canada, this would ideally take place earlier in the planning process before any applications are invited for wind energy development, and thus before specific projects are proposed and assessed, providing scope for broader stakeholder engagement in renewable energy planning, earlier identification of sensitive areas, establishment of impact thresholds, pre-empting common public siting issues and concerns, and streamlining project-specific assessment and permitting processes.

Other researchers agree - Jay (2010a), for example, indicates the benefits of strategic EA in energy sector planning to address GHG emission and land use issues; Horbaty et al. (2012) argue that spatial planning is needed before projects are considered, to address land use issues and conflicts related to location selection for wind energy projects; and Khan (2003) explain that a well-planned siting can solve concerns about the effects of development on the landscape, leaving only technical measures to project reviews. Strategic assessment may involve the designation of appropriate wind power sites in regional land use plans and considering their impacts at the strategic level, which can provide developers with guidance to address local level conflicts. For example, in 1998, Germany introduced a zoning category - "suitable area" (Eignungsgebiet), within their regional planning system to avoid environmentally sensitive or potentially conflicting areas for energy developments (Geißler et al., 2013; Mallon, 2006). A similar planning model has been integrated through the national designation of areas for wind power development in local plans of Denmark (Mulhivill et al., 2013).

Strategic EA can also help mediate conflict between the technical and social issues of wind energy development (Cowell, 2010; Romanson & Mulvihill, 2011), such as those identified in western Canada EAs. Project EA, at the local level, may then face less conflict or concerns and proponents can focus on already defined mitigation measures. This can potentially lead to meaningful and efficient project EA reducing timeliness and financial burdens for project-level reviews (Noble, 2017). Western Canada may look to examples from practice from other regions. In Brazil, for example, a strategic EA was applied to renewable energy (hydro energy and biofuel production) to address significant conflicts raised during EA revision and approval, including assessing cumulative impacts (Malvestio & Montaño, 2013). The Norwegian government develops strategic EAs that identify preferred regional locations for wind energy, allowing concentration of wind farm installation in areas which are both economically and environmentally feasible (Thygesen & Agarwal, 2014). There are also lessons to be learned from eastern Canada, where strategic EA has been applied to offshore tidal energy. Doelle (2015) explain that in this case the strategic EA focused on: engaging the public to address key issues and concerns prior to any projects being proposed or sites selected; understanding and minimizing potentially negative impacts from tidal energy; and the distribution of impacts, benefits, risks and uncertainties. Doelle & Critchley (2015) suggest that the broader policy issues associated with wind energy similarly need to be addressed through strategic EAs before individual projects are proposed and designed. Doing so may reduce opposition at the local level, allow developers to identify and avoid unnecessary problems or concerns (Doelle & Critchley, 2015), and facilitate energy transition through renewables development.

Chapter 6
CONCLUSION

Accelerating the transition to a low carbon future will require a significant expansion of renewable and clean energy generation capacity (Balcilar et al., 2018; Gielen et al., 2019; IRENA, 2018; Potvin et al., 2017; Steg et al., 2018). Energy projects are often met by resistance and concern (Ceglarz et al., 2017; Devine-Wright, 2005; Udofia et al., 2017) and renewable energy projects are no different (Geißler et al., 2013; Larsen et al., 2018). Despite the potential contribution to establishing a sustainable low-carbon energy system, wind energy development often generates concerns about potential environmental and socio-economic impacts and faces challenges including public opposition and organized resistance during planning and permitting processes (Aitken, 2010a; Devine-Wright, 2005; Jami & Walsh, 2017; Songsore & Buzzelli, 2015).

Potential environmental and social impacts from any development, including wind energy, are generally assessed through EA. However, EA processes are criticized for their inefficient and inadequate consideration of stakeholders' concerns and weak influence on decision making process (Booth & Skelton, 2011a; Cashmore, 2004; Larsen et al., 2018; Udofia et al., 2017). A major challenge is that project EA primarily focuses on project specific issues, but many issues raised during EA are beyond the capacity of project proponents to address and often beyond the scope of project EA (Booth & Skelton, 2011a; Chetkiewicz & Linther, 2014; Gibson et al., 2010; Noble, 2017; Udofia et al., 2017). These "bigger picture" issues can cause additional cost, delay or conflict and cannot be sufficiently resolved at the time and scale of project EA (Chetkiewicz & Linther, 2014; Hegmann & Yarranton, 2011; Larsen et al., 2018; Noble, 2017; Smart et al., 2014). To manage expectations of what EA can deliver and what is beyond its scope, there is a need to identify the recurring issues and concerns that are raised by government reviewers, project interveners, and other affected interests when wind energy projects are proposed. Understanding these issues and concerns is important to managing the transaction cost for renewable energy projects and improving EA processes for energy transition.

This research examined a sample of 16 wind energy EAs in western Canada and found that most of the typical issues raised by the public and other interests are project specific. These include such key issues as impact on terrestrial environment, noise, visual impact, flickering/strobe light effects/shadow/light pollution, impact on recreation, and impact on health. These routine issues and concerns cut across the sample of wind energy projects and are directly related to the project at hand. However, these project EA are examined on a case-by-case basis and lessons learned from or information generated through one assessment are not transferred to the next (Ball et al., 2013; Hackett et al., 2018; Noble et al. 2017). This knowledge gap causes uncertainty for project developers and communities about impacts and associated issues and concerns (Noble et al., 2017; Write, 2014). Lack of available information and data due to limited sharing of knowledge across projects often contribute to raise higher number of typical issues repeatedly (Noble et al., 2017; Sheate & Partidario 2010; Write, 2014). A coordinated framework to share and transfer knowledge across projects could support to prevent these common issues raising again and again (Ball et al., 2013; Hackett et al., 2018; Write, 2014).

For some of these issues, routine mitigation measures may be available and could be easily identified to pre-empt such concerns in the EA process by developers and decision makers. For other issues, where mitigation measures may not be known, more collective action may be necessary. To address these issues, improvements in the project-specific terms of reference for project EAs – to provide clear and consistent guidance for proponents on the types of issues that need to be addressed, based on what is known be typical or routine, is needed (Gartman et al., 2016; McMaster et al., 2020). McMaster et al. (2020), for example, argue that more standard terms of references may improve the efficiency of EA process, determining the typical issues and mitigation solutions, clarity expectations, and reduce uncertainty of EA processes for wind developments. Such terms and conditions, or at least general guidance, could be developed in Canada by a knowledge broker, such as the Canadian Council of Ministers of the Environment or the Canadian Wind Energy Association (McMaster et al. 2020), similar to other national guidelines on matters such as water quality or soil remediation standards (e.g. CCME, 2017).

However, this study also identified other typical issues from the sample of EAs for wind energy projects which are likely more strategic in nature. For example, impact on other tenure holder/license/land usage, loss of property value, biophysical and social cumulative impacts, benefit from the project to the community, and impact on and access to TU sites/resources. These are not unique issues to western Canada, given that wind energy developments in Norway and Sweden are raising similar concerns with cumulative impacts on the landscape and conflicts with traditional use patterns (Szpak, 2019; Norman, 2020; Lee, 2019 October 17; Fjellheim & Carl, 01 Aug 2020). Attempting to address these strategic issues through project EA may only result in further conflict and thus hinder investment in wind energy development. This research suggests that such priority policy and planning issues need to be addressed through a more strategic process. Strategic EA has the opportunity to address these issues and provide meaningful guidance to project EA prior individual projects being proposed (Cowell, 2010; Doelle & Critchley, 2015; Geißler et al., 2013; Mulvihill et al., 2013; Romanson & Mulvihill, 2011; Thygesen & Agarwal, 2014). This will allow developers to avoid unnecessary conflict and cost and focus on managing project specific impacts, thus helping facilitate energy transition through renewables deployment. However, notwithstanding the promise of strategic EA, no jurisdiction in Canada has adopted a formal strategic EA process (Doelle & Critchley, 2015; Noble et al., 2019).

As all wind energy projects do not undergo EAs, this study does not claim that the full range of issues raised associated with wind projects can be identified by focusing only on EA applications. Incomplete documentation for EA process is another limitation of this research. In some projects, specific documentation was lacking containing comments to the EA process, which might reduce the accuracy of the number and diversity of issues identified. Although the results from this research could provide direction to understand the typical issues raised regarding wind energy development, they may not be representative of all recurring issues associated with wind energy development. Future research focusing on EA submissions and comments to wind energy projects of all provinces of Canada could identify a more enriched set of recurring issues and concerns. This research could also inspire future research to determine recurring issues raised with other renewable energy development. Determining these issues is necessary to understand and increase the ability of EA process to address stakeholders' concerns during EA for renewable energy development, thus improving the role of EA in energy transition (Larsen et al., 2018). This will inform future EA practice by providing proponents, communities, EA practitioners and governments with different information, experience and frames of reference for assessing alternative energy projects and contribute to existing EA scholarship. To validate these findings and explore in-depth the recurring project and strategic issues, future research could engage insights from project proponents, interveners who raise such issues, and government policy and decision makers. This research did not look for specific solutions for broader strategic issues and therefore recommends that research is necessary to explore viable options to address these issues effectively as these are pre-requisites to renewable energy investment and to facilitate energy transition.

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